HamTrain's Foundation Study Guide 2026

Helping you to study for your first amateur radio licence

For UK Foundation Amateur Radio Exams from April 2025

ESSEX HAM

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HAMTRAIN'S FOUNDATION STUDY GUIDE 2026 EDITION

This book is intended to be a simple revision guide for those studying to pass the UK Amateur Radio Foundation Exam.

This guide is designed to complement HamTrain's free Foundation Online training course, which contains a more detailed description of the course material, videos that explore key points in easy-to-understand ways, plus quizzes, handouts, mock tests and

slides to help you prepare for your Foundation exam.

For details of the online course, go to www.hamtrain.co.uk

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Introduction

Welcome to the HamTrain Foundation Study Guide, created by Essex Ham. This book is designed as a simple revision guide for those studying to pass the UK Amateur Radio Foundation Exam.

The Essex Ham “HamTrain” team has been working hard since 2015 to make it as easy as possible to get into amateur radio. At the time of writing, we’ve had over 14,000 enrol on one of our free Internet-based courses, and our training material is used by clubs and groups around the UK.

We’ve been asked by students for a

simple guide covering the main exam syllabus points that they can carry with them for study on the move. Following this excellent suggestion, we first released this study guide in 2024, and based on feedback from the first release, we've published an updated 2025 version, in both paper and electronic format, as well as an audiobook version.

We hope that people will use this, along with our unique course, to help to pass the Foundation exam and get started with amateur radio.

Using This Guide

This is not intended to be a lengthy book discussing the hobby in-depth, nor is it intended as a book that goes into great detail about every aspect of the technical details of how things work. If that's what you're looking for,

other books are available. Instead, this touches on each area of the RSGB's exam syllabus, highlighting all of the key facts that you need to either a) remember, or b) understand to confidently pass your exam.

This guide contains a number of tables and graphs, some of which may split across pages on your device. If this happens, consider changing the font size or zoom level, or rotating your device as needed.

Guide Feedback

All feedback on our Foundation Study Guide is appreciated. If you have any comments, ideas, or areas where we can improve, please contact us using the following email address: bookfeedback@essexham.co.uk

If you find this guide useful, please consider rating us on Amazon, Apple Books, Google Books or Kobo Bookstore, as this helps us to get noticed.

About Our Course

Our free online course typically runs twice a month (with a “fast track” option for those in a rush). The course is split into nine modules, which line up with the chapters of this book, and each module ends with a short quiz.

The course lets you study when it’s suitable for you – no live lessons, and no need for a webcam. Each module also has a full video, so you can watch as we discuss the material and demonstrate how things work.

In the course, you’ll be working in an

online classroom with other students and have the option to ask questions of the tutor and chat with other students. At the end of the course, there's a mock test to see if you're ready to sit the actual exam. We've included one of our mocks at the back of this book, too.

To find out more about the free Foundation Online course, and to book a place, go to www.hamtrain.co.uk

1. Getting Started

The good news is that you don't need a technical background, previous radio experience, or any special equipment to get started. This opening section of the book provides a brief overview.

1.1 Why Amateur Radio?

The fact that you're reading this book means that you're probably already aware of the basics of amateur radio. In summary, it's a practical, hands-on hobby that combines technology, communication, ongoing learning and a way of connecting with like-minded others. The hobby offers far more than

simply talking on a radio, for example:

- Independent communication - You can make contact locally and around the world using your own equipment, without relying on mobile phone networks, the Internet or even mains power.
- Learn how radio and technology work - Amateur radio gives you a practical understanding of radios, antennas and signals, rather than treating technology as a mysterious “black box”.
- More than just ‘voice’ - Alongside voice contacts, amateurs use computers, digital modes, dedicated satellites and software-defined radios.
- Build and experiment – Whilst it’s not for everyone, licensed amateurs are allowed to build and experiment with their own equipment, from simple antennas to complete radio systems.

- Useful real-world skills - The hobby helps you to develop technical knowledge, operating discipline and problem-solving skills that carry over into work and everyday life.
- Operate anywhere – Many newcomers start with a £20 handheld radio, then move on to setting up a home station, operating 'mobile', or setting up a temporary station at interesting locations.
- A sense of community – Across the UK, there are lots of local clubs (both physical and online), regular on-air meet-ups, rallies, competitions, and you'll find there's plenty of help available for newcomers, both online and on the air.

1.2 First Steps

If you're new to the world of amateur radio and looking to get started, you're probably already aware that the entry-

level way into the hobby is the UK's **Foundation licence**.

Many years ago, getting started with amateur radio meant taking months of evening classes and learning Morse code. That all changed some years ago, and things got even easier as a result of the 2020 Covid lockdown, which saw exams move online. This allowed newcomers to be able to sit their exams at home and not have to wait months for a local course or trek miles to their local amateur radio club.

To get on-air with amateur radio, you need to pass the short multiple-choice Foundation exam, and after passing, you can get an amateur radio licence and a unique callsign. From then on, you're free to explore this unique hobby and go where your interest takes you. You might fancy chatting with like-minded locals, talking around the world, sending text and images via satellite, experimenting with different types of wireless tech, making

contacts with distant stations, or simply learning more about communications and how the technology we take for granted works.

To pass your Foundation exam, you'll need to study various aspects of the hobby, including getting a basic understanding of the technical side of amateur radio, learning the basics of transmitters and antennas, how radio signals can be sent around the world and how to stop your signals from causing interference. The exam also includes questions about the rules and regulations set out by the UK's radio regulator Ofcom, as well as how to operate on-air and make contact with the worldwide amateur radio community.

The exam itself is nothing to worry about – it may be years since you sat an actual exam, but Foundation is pretty straightforward, you can take the exam at home, and this book contains everything you'll need to know to get a pass.

1.3 What is Amateur Radio?

Here’s where the learning starts, as the following paragraphs are examinable:

- Amateur Radio is for self-training and experimentation.
- It is non-commercial (No business use or commercial advertising).
- Amateur Radio is a recreational activity that promotes technical innovation, development of technical skills and international friendship.
- The **Foundation Licence** is the first of three UK levels: **Foundation**, **Intermediate** and **Full.**

1.4 Getting Your Licence

To get your Foundation licence, you'll need to take a short exam, managed by the RSGB (the Radio Society of Great Britain).

The exam lasts one hour and consists of 26 multiple-choice questions. You can

take your exam online, remotely monitored by a volunteer invigilator via a webcam, or you can take the exam in person at one of the amateur radio clubs around the UK. At the time of writing, the exam fee is £35.50.

Once you pass, you get your Ofcom amateur radio licence online (for free), plus your unique callsign – and then you're free to explore this truly unique hobby. You may optionally decide to progress to the Intermediate or Full levels if you wish.

1.5 Exam Material

For the actual exam, you're allowed to take just one piece of reference material, which is a 4-page exam booklet containing important information. This is issued by the RSGB, and we strongly advise you to download and print a copy of this booklet to help with your studies.

Download the 4-page exam booklet from: **www.sxham.uk/ex307**

2. Technical Basics

Before we dive into this chapter, it's only fair to give you a heads-up that, for many, Technical Basics is a challenging chapter, especially for this early on in your studies.

For those new to electronics or with no desire to take a radio apart and look inside, this section can be seen as a scary one. The good news is that, for the Foundation exam, this section only accounts for 3 marks, and with a pass mark of 19 out of 26, you can afford to get all of these questions wrong and still comfortably pass, so don't worry too much!

For those with an existing knowledge of electronics, this section is perhaps a little basic, leaving a few gaps. It's important to appreciate that Foundation is the first of 3 levels, and the intent within the RSGB appears to be that Technical Basics sets up core knowledge that will be built up at Intermediate and Full.

Whether you feel that all of this section is alien or a little too basic, please review the section, watch our online course videos if that helps, and please stick with it, as things covered in this section will all start to come together after a few more chapters of the material.

To start this section, we're going to look at the key symbols and values that you'll need to know on your journey into amateur radio, and for your Foundation exam.

2.1 Key symbols and values

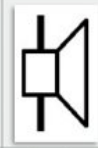
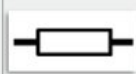
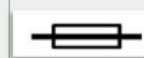
You'll need to know these for the Foundation exam:

Measured in	Symbol	Units
Voltage	V	Volts
Current	I	Amps
Resistance	R	Ohms
Power	W	Watts
Frequency	f	Hertz
Wavelength	λ	Metres

Prefix	Meaning	Example
micro	one millionth	1000 µV = 1 mV
milli	one thousandth	1mV = 0.001V
kilo	one thousand	2000 W = 2kW
Mega	one million	3MHz = 3,000,000Hz
Giga	one thousand million	2.4GHz = 2,400MHz

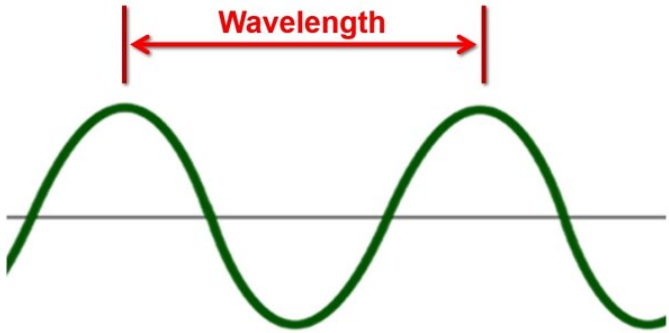
2.2 Symbols

Here are the symbols you'll need to remember and recognise for the Foundation exam:

					
Cell	Battery	Lamp (or bulb)	LED	Microphone	Speaker
					
Antenna	Earth	Resistor	Switch (s.p.s.t)	Fuse	

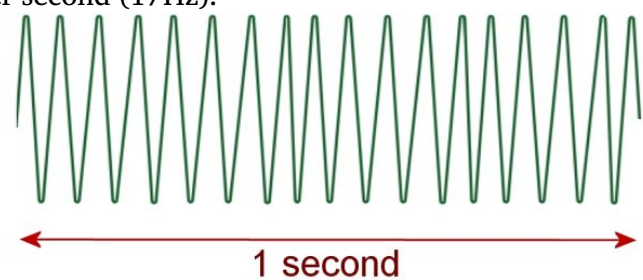
2.3 Frequency and Wavelength

Pictured here is a single radio wave. The length of the wave is measured from the top of the peak to the top of the next peak:



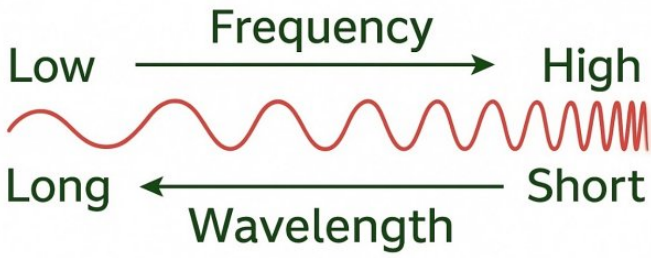
Measuring a wavelength

Frequency is the number of times that a radio wave happens per second. This is measured in Hertz. Here is a graphic showing 17 cycles per second (17Hz):



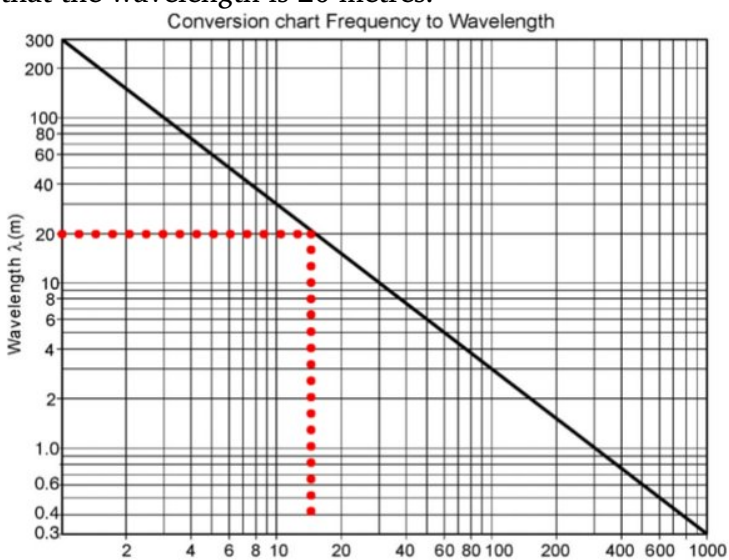
As an example, if you were listening to BBC Radio 1 on FM on your car radio, the length of each wave would be around 3 metres (as long as a tiger), and you'd be receiving around 98,000,000 of these waves every second.

You need to understand that as the frequency rises, the length of the wave reduces, as shown in this diagram:



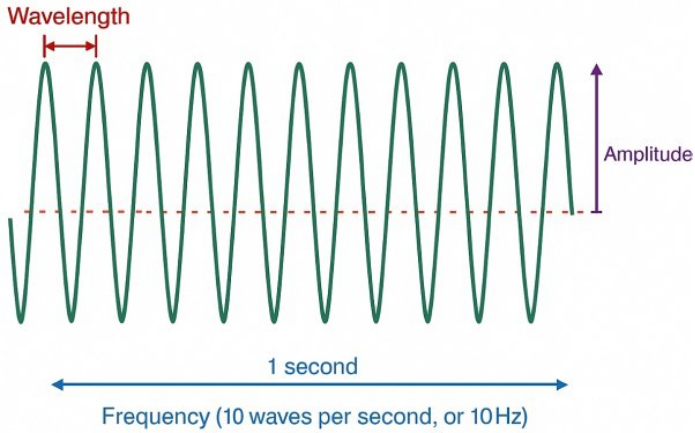
For the exam, you'll find a table in the 4-page exam booklet that allows you to convert between frequency and wavelength.

The following image shows how to use the converter to find the wavelength for 14MHz; simply follow the dotted line up from roughly 14MHz to the diagonal line, then follow across to the left, to see that the wavelength is 20 metres.



Frequency & Wavelength conversion table – found in the 4-page exam booklet

The following graphic shows wavelength, frequency (10 cycles per second), and also the wave's height (known as amplitude):



The frequency ranges are split into three “bands” that you’ll need to remember for the exam:

HF – High Frequency *(around the world comms)*	3 to 30MHz	
VHF – Very High Frequency	30 to 300MHz	
UHF – Ultra High Frequency	300 to 3,000MHz	

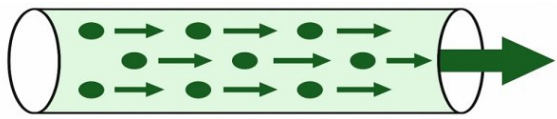
You’ll also need to be familiar with the following two terms:

RF stands for “Radio Frequency” (signals sent or received over radio).

AF stands for “Audio Frequency” (signals containing speech or something we can hear with our ears).

2.4 Circuits

The flow of electrons in a circuit is known as the current (measured in Amps).



Flow of electrons in a piece of wire

A circuit is needed to allow current to flow, and that circuit will include a source of electrical energy.

The polarity (plus and minus) must be correct for electronic circuits to function correctly, or damage may be caused.

A conductor allows electrons to flow easily, and an insulator does not.

Conductors: Copper and brass are good conductors, as is carbon.

Insulators: Plastics, rubber, glass and ceramics.

Be aware that current can flow across wet insulators.

2.5 Resistance

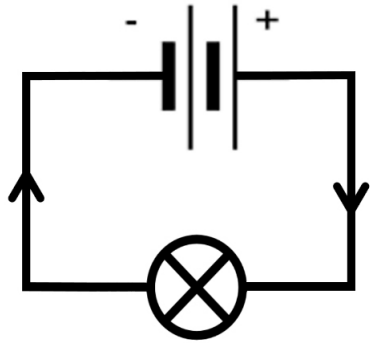
Resistance is the property of a material that opposes the flow of electricity.

A resistor

A current flowing through a resistor results in the conversion of electrical energy to heat energy in the resistor.

2.6 Direct and Alternating Current

In the circuit shown here, you can see a battery powering a lamp.



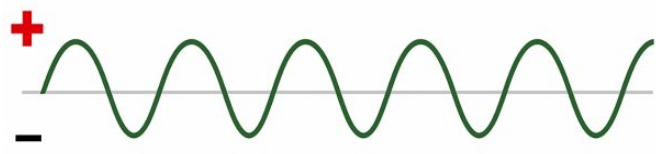
A basic circuit with a battery and a lamp

Current is flowing from a single direction through the lamp and back to the other terminal in the battery. This is known as “direct current”.

The battery in this circuit is producing DC Volts.

Voltage is sometimes referred to as “Potential Difference”.

The other form of current we might experience is Alternating Current (AC), where the current alternates in waves from positive to negative. Whilst batteries are DC, the UK mains voltage is AC – alternating around 50 times per second.



An alternating waveform

2.7 Batteries

A battery is a combination of cells (usually in series).

A battery provides electrical energy from stored chemical energy and has a Potential Difference across its terminals.

A rechargeable (secondary) battery has a reversible chemical process.

Any unwanted battery must be properly disposed of.

2.8 Formulas

This section tends to create the most worry, especially if maths is not your speciality. For Foundation, you need to remember just two formulas:

Voltage = Current multiplied by Resistance

Power = Voltage multiplied by Current

To make this easy, we're going to introduce you to the 'Triangle Trick'.

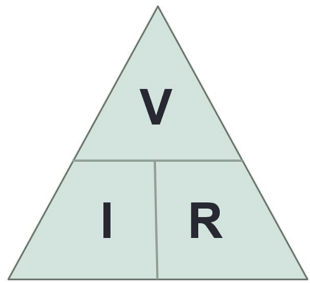
In the exam, you may be given two values and asked to calculate the third value. In a moment, we'll show you drawings of the two 'triangles'. The trick is to draw the appropriate triangle on a bit of blank paper and cover the letter representing the missing value with your thumb. For example:

If you're given a voltage and a resistance (V and R) in an exam question, then you need the current (I). Cover the I in the first triangle with your thumb, and you can see that the answer is V over R (voltage divided by resistance).

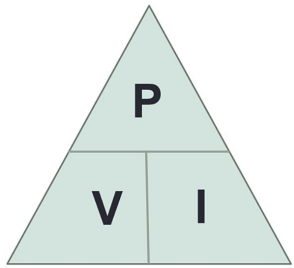
Need to calculate power in watts? Cover the P, and you can see that the answer is V times I (voltage x current).

The good news is that you can use a calculator in the exam.

The two Foundation formula triangles



Voltage = I x R Current = V / R Resistance = V / I



Power = V x I Voltage = P / I Current = P / V

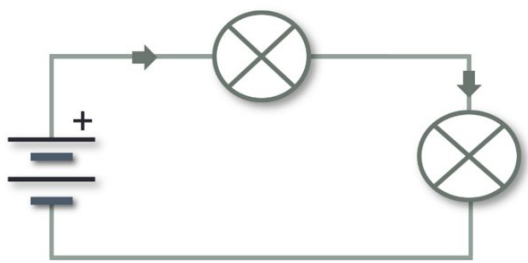
For a video with examples, go to www.sxham.uk/trainvids

2.9 Series and Parallel

Here we see examples of two types of circuits that you'll need to know for the Foundation exam:

"In Series"

- The current passes through one lamp, then the other
- The current passing through both lamps is the same.
- If one lamp fails, the circuit is broken.

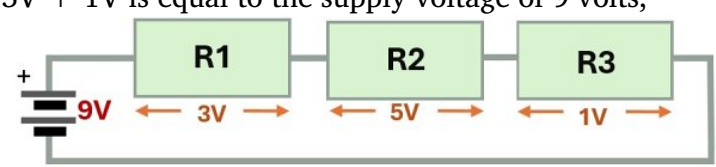


Circuit showing two lamps in series.

The voltage required for the circuit is the sum of the individual voltages across each component, such as a lamp or a resistor.

In the following circuit, there are 3 resistors of different values. They all have different voltages across them.

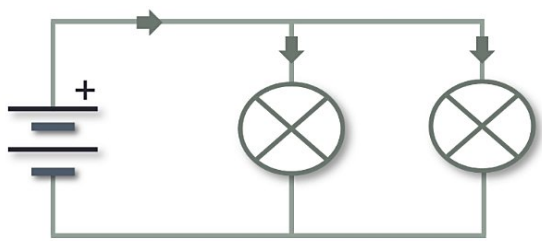
3V + 5V + 1V is equal to the supply voltage of 9 volts,



Series circuit showing voltages across three resistors

“In Parallel”

- Current passes through both lamps
- The same voltage (potential difference) is applied across each of the lamps
- The circuit’s total current is the sum of the current through each lamp
- If one lamp fails, the other lamp will continue to work



Circuit showing two lamps in parallel.

2.10 Digital signals

Analogue signals are constantly changing in amplitude, frequency or both. By contrast, digital signals are a stream of finite values at a specific sampling interval.

For the exam, remember that digital signals can be processed by a computing device with suitable software.

An Analogue to Digital Converter (ADC) is a device used to sample an analogue signal and produce a digital representation of it.

Analogue signal converted to digital

A Digital to Analogue Converter (DAC) is a device used to represent a digital signal in an analogue format.

Digital signal converted to analogue

Inside a low-price USB digital software-defined radio receiver. We'll discuss this type of radio in the next chapter.

2.11 Important values

You may be asked one or more of the following in the exam:

Frequency of the UK 50Hz (50 cycles per second)
Range of frequencies 20Hz to 15kHz
Range of frequencies 300Hz to 3kHz
Range of frequencies communication
Range of radio frequ 3kHz to beyond 3,000MHz • HF: 3MHz to 30MHz • VHF: 30MHz to 300MHz • UHF: 300MHz to 3,000MHz

3. Transmitters and Receivers

This section accounts for 3 marks out of 26 in the Foundation exam.

The function of a radio **transmitter** is to send information from one place to another using electromagnetic radiation/wireless technology.

The function of a radio **receiver** is to recover information sent from one place to another using electromagnetic radiation/wireless technology.

3.1 Modulation

Radio signals are made up of two parts: the audio (the message) and the required radio frequency (the carrier).

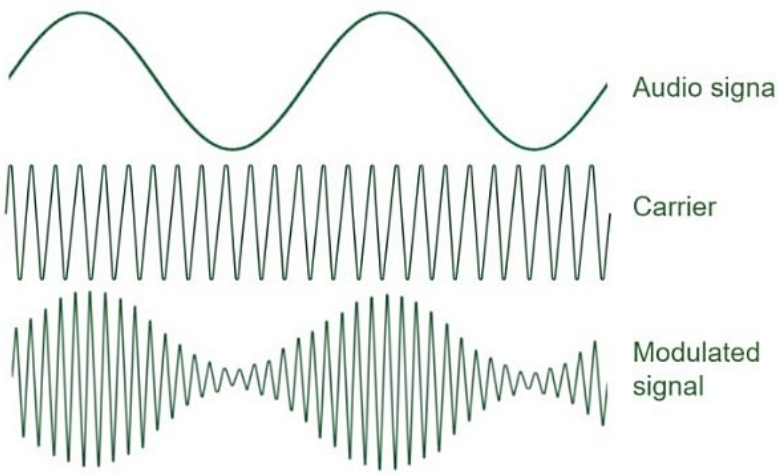
The process of adding information to a radio frequency carrier is known as modulation. There are two common types of modulation

– Amplitude Modulation and Frequency Modulation:

Amplitude Modulation (AM)

An AM signal combines the audio signal with a carrier on a set frequency to form a modulated signal.

You will see that the resulting modulated signal increases and decreases in height (amplitude) depending on the volume of the audio signal:

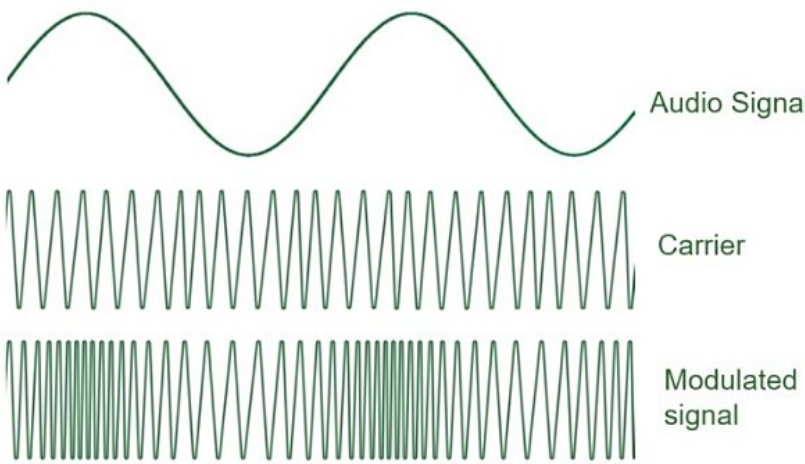


Example of Amplitude Modulation

Frequency Modulation (FM)

Again, the audio signal is combined with a carrier on a set frequency. This time, the height of the waves in the final radio signal matches the height of the carrier.

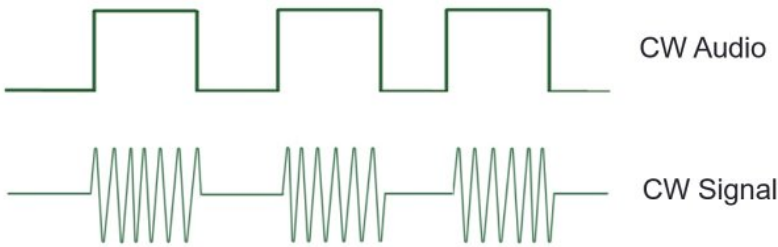
Note that, unlike AM, the height of the resulting signal is constant - i.e. the amplitude doesn't change. Instead, when the volume of the audio signal is louder, the waves are closer together (i.e. the frequency of waves per second increases).



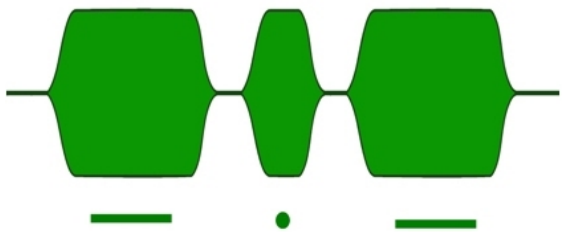
Example of Frequency Modulation

CW (Morse code):

A simpler form of modulation is used to send Morse code – Using Continuous Wave (CW):



Example of CW Modulation

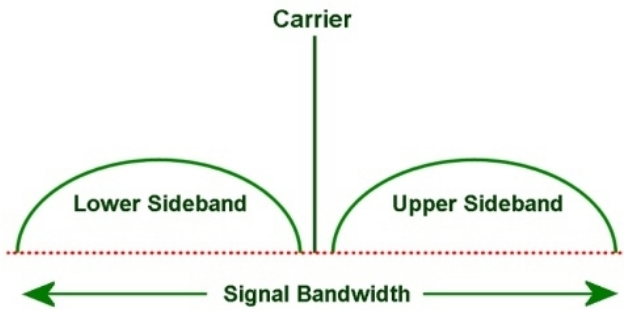


The letter "K" in Morse code

Single Sideband (SSB) Modulation:

For AM (amplitude-modulated) transmissions, when you mix the audio signals with the radio signals, it results in "sidebands" being created – these are just below and just above the carrier frequency. These are referred to as Lower and Upper Sidebands.

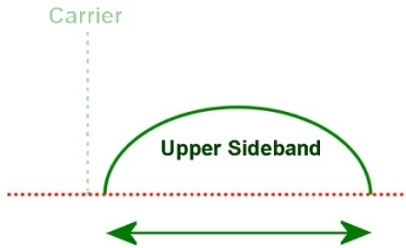
This is what an AM signal would look like - two sidebands on either side of the carrier:



Rather than transmitting both sidebands (as you do with AM), you can transmit using just one sideband - this is a more efficient method. Instead of transmitting two sidebands, you'll get better results using all your transmitted power for just one (either Lower or Upper Sideband - LSB or USB).

This is known as Single Sideband, or SSB,

operation, and this method is commonly used on amateur radio bands.



Example of a single sideband signal

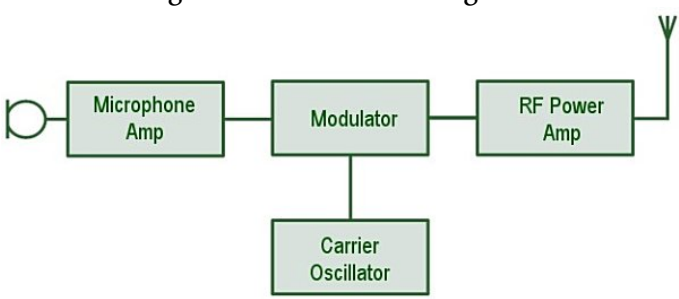
Compared with AM, SSB is a more efficient method of communicating on HF, as it uses less bandwidth (because the signal is half as wide)

3.2 Transmitters

A radio transmitter has four basic stages, as follows:

- **Microphone Amp (Audio Stage) -** Gets and amplifies weak signals from the microphone
- **Frequency Generator (Oscillator) -** Creates the radio 'carrier' signal on the required frequency
- **Modulator -** Mixes the radio and audio signals together
- **RF Power Amplifier -** Increases the combined signal and feeds it to the antenna

For the Foundation Exam, you will need to be able to identify the 4 boxes in the following transmitter block diagram:



Transmitter box diagram – a common exam question

In the above diagram, on the left, you have the microphone, which is amplified to a usable volume. This is the audio signal. At the bottom of the diagram, the Oscillator generates the required

frequency. They are mixed together by the modulator to make the combined radio signal. They are then amplified and sent to the antenna.

Incorrect setting of the Oscillator can result in operation outside the amateur band and interference to other users.

The microphone volume (gain) must be set correctly to avoid distortion. Too loud a signal causes “over-modulation” (AM) or “over deviation” (FM), possibly causing interference to neighbouring frequencies.

The RF power amplifier output must be connected to a correctly matched antenna to work properly. Use of the wrong antenna can result in damage to the transmitter.

3.3 Receivers

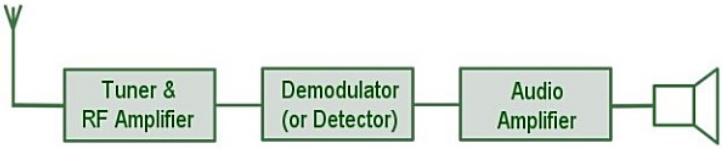
For the Foundation exam, you are required to understand three parts of how a radio receiver works.

The three stages are represented in the following diagram, which you may see in your exam. Become familiar with the three stages and what they do.

- ☐ **Tuning / RF Amplifier** - The receiver is tuned into the required frequency, and the weak signal is amplified so that it can be used.
- ☐ **Detector (or Demodulator)** - This part of a receiver extracts the original audio signal from the modulated RF radio signal. The process of recovering the original audio is known as “demodulation”, and it separates the audio signal from the carrier. There are different types of detectors for each modulation type (e.g. FM, AM, SSB, etc.)
- ☐ **Audio Amplifier** - This stage amplifies the recovered audio signal and feeds it to a

loudspeaker or headphones.

For the Foundation exam, you will need to be able to identify the 3 boxes in the following receiver block diagram:



The Receiver box diagram

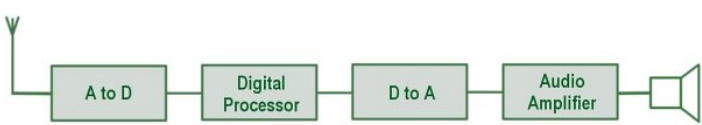
3.4 Software Defined Radios

A software-defined radio (SDR) differs from an analogue radio in that the work is done digitally using a computer processor. Here are the basics:

For the Foundation exam, you'll need to know the basics of how an SDR receiver and transmitter operate and be familiar with their block diagrams.

SDR Receiver

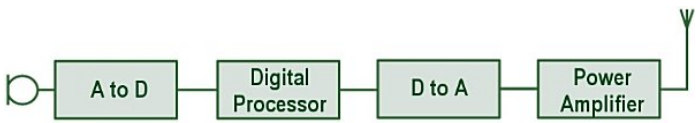
- Incoming signals are converted from analogue to digital (A-to-D).
- A mathematical operation in the SDR enables all of the radio signals to be sifted into separate frequency components.
- The required signal is selected using a filter (defined in software).
- Demodulation is carried out in software.
- The resulting signal is converted from digital to analogue (D-to-A) and amplified for the speaker or headphones.



SDR Receiver box diagram

SDR Transmitter

- Speech is converted from analogue to digital (A-to-D).
- The modulated radio signals are generated using software.
- The resulting signal is converted from digital to analogue (D-to-A), then amplified and fed to the antenna.



SDR Transmitter box diagram

4. Feeders and Antennas

This section accounts for 3 marks out of 26 in the Foundation exam.

4.1 Feeder types

Feeder is used to connect the transmitter/receiver to the antenna.

Feeders exhibit “loss” on transmit and receive – the longer the cable run, the greater the amount of loss. Loss occurs as some of the RF energy is converted to heat.

Feeder loss increases with frequency, so a thicker, low-loss feeder is required for VHF and UHF.

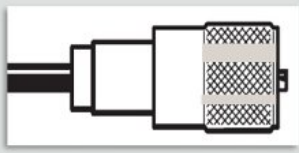
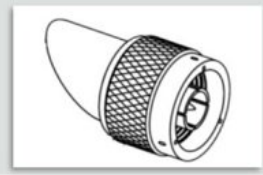
Here are the two types of feeders covered at Foundation:

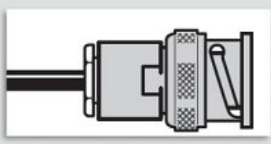
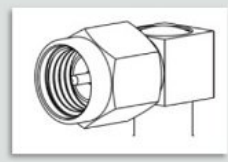
Twin Feeder (Ladder-line)

- Balanced
- Widely used by amateurs
- Constant separation between the two wires

4.2 Cable connectors

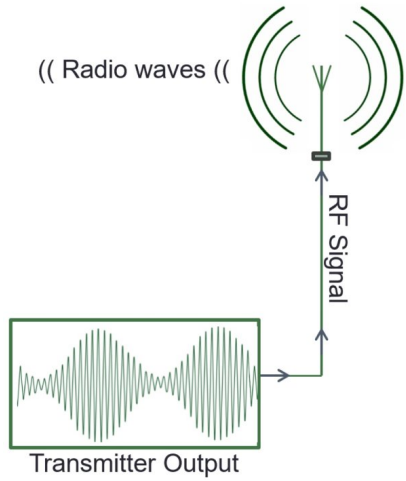
There are four types of connectors that you will need to know about at Foundation:

PL259	N
Screw-thread locking Common for HF	Screw-thread locking Common for VHF/UHF
	

BNC	SMA
Bayonet locking We use 50Ω (not the 75Ω version which has a different type of pin)	Screw-thread locking Often found on handheld radios
	

4.3 Antennas

Antennas convert electrical signals into radio waves (when transmitting) and convert radio waves into electrical signals (when receiving).



A transmitter output connected by feeder to a radiating antenna

Antennas are designed for specific frequencies, and there are different sizes for different bands. In general, longer wavelengths (lower frequencies) need larger antennas.

Over the next few pages, we're going to look at the five different antenna types that you need to be familiar with for the Foundation exam:

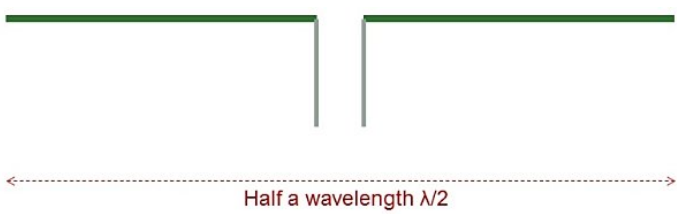
- The Dipole
- The 1/4 (quarter) wave
- The 5/8 (five-eighth) wave
- The End-fed long wire
- The Yagi (beam antenna)

The Dipole

The dipole is a basic antenna, common in amateur radio.

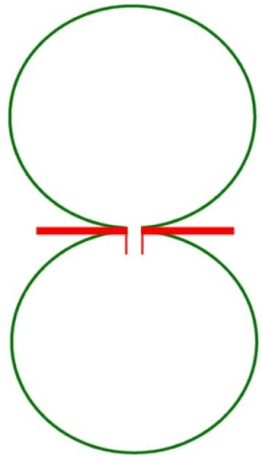
Example of a horizontal dipole antenna

The total length of a dipole is commonly **half a wavelength long**.



Example: To receive a station on 14.0MHz, you need to know the length of the wave. In the 4-page exam booklet, there is a conversion table. From this, you can see that the wavelength for 14MHz is 20 meters. In this example, the total length of the dipole will be 10 meters (half the wavelength of 20 meters).

The next picture shows the “polar pattern” for a half-wave dipole, with the green showing how the signal radiates:



Dipole polar pattern

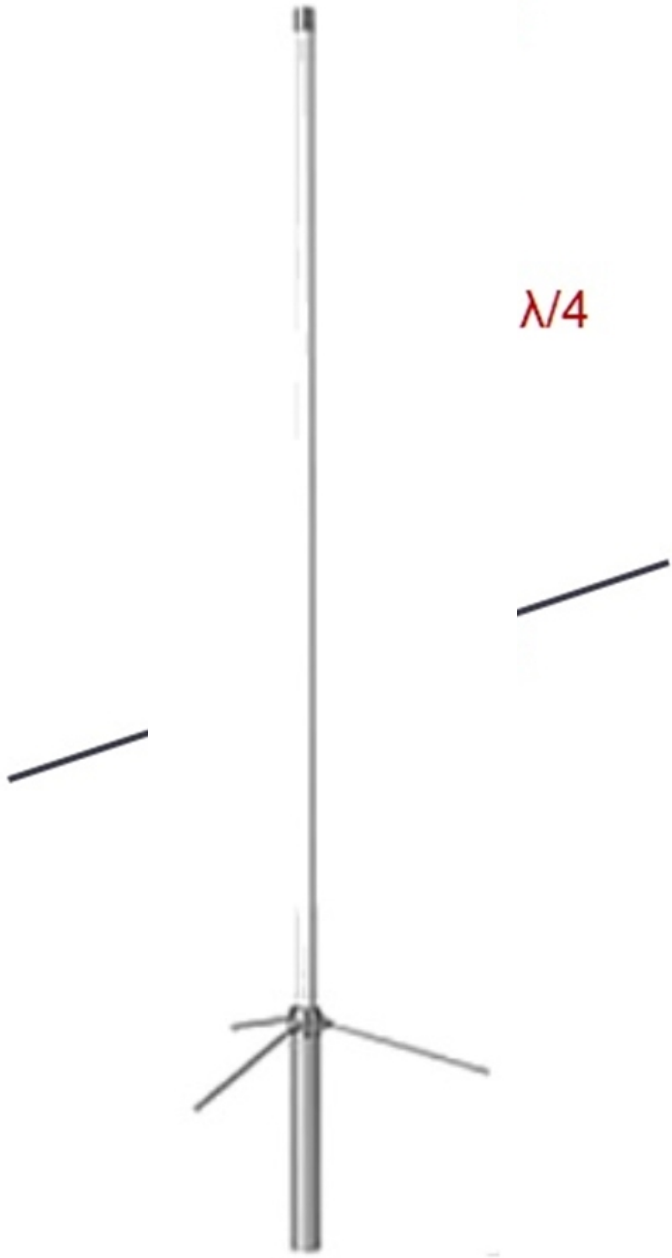
The ¼ Wave Ground Plane

This is a vertical antenna, commonly used for VHF and UHF frequencies.

As the name suggests, the antenna is a quarter of a wavelength long.

This type of antenna is "omnidirectional", meaning that signals are sent out in all directions.

Looking at the diagram of a 1/4 wave antenna, you will see four horizontal wires at right angles to the antenna. These are called radials, and together they form a ‘ground plane’.



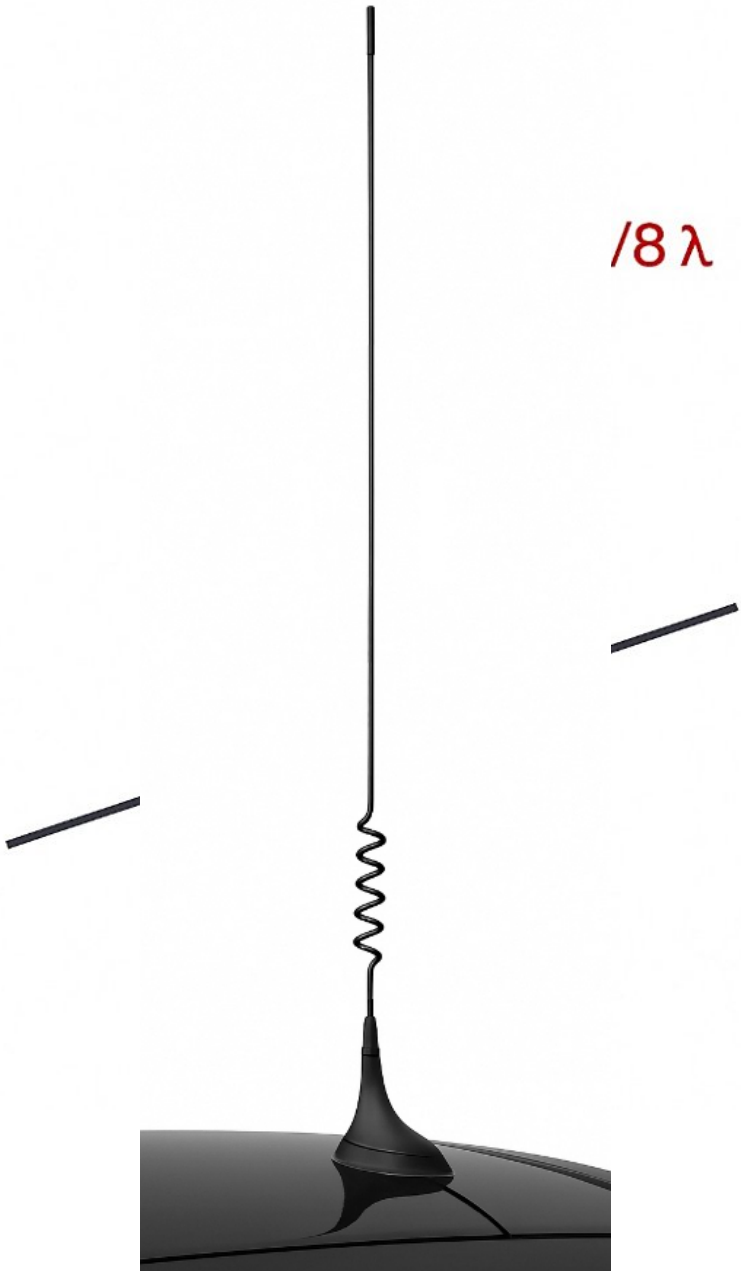
The ground plane acts as a mirror for the radio

signals, helping to reflect the signals horizontally to increase the range.

The 5/8 Wave Ground Plane

This is another vertical antenna. It is 5/8 of a wavelength long.

You will recognise it by the coil at the base. This 'loading coil' is there to provide a good match for the coaxial feeder.



This type of antenna is "omnidirectional",

meaning that signals are sent out in all directions.

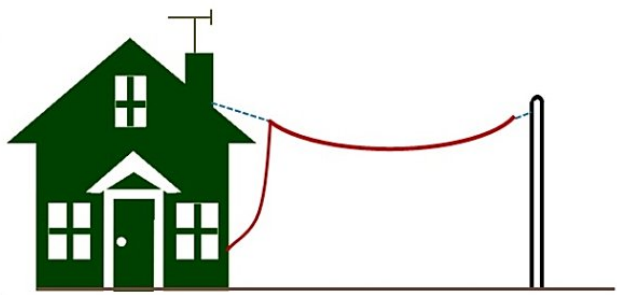
This antenna is often used for VHF / UHF mobile operation. When used on a metal car roof (that makes a good "groundplane"), this helps to send more of the energy out horizontally to get the best range when mobile.

The End Fed Long Wire

The end-fed long wire is a basic antenna - just a long piece of wire of a random length.

This is unlikely to be the correct length for any specific frequency, so it needs to be ‘matched’ - More on this later in this section.

The end-fed antenna is more likely to cause interference (EMC) than other types of antenna (a common exam question).



In this image, the solid line represents a long-wire antenna fed from a downstairs shack to a pole at the end of a garden. The dotted line represents an insulated supporting guy line securing the antenna to a chimney.

The Yagi

The antennas we have mentioned so far are omnidirectional, meaning that they send radio signals out in multiple directions.

The **Yagi** is different in that it is a directional antenna. This type of antenna focuses the signal mainly in one direction and is pointed in the direction of the station you're trying to contact. They can also be used to receive distant signals.

By sending radio signals in a focused beam, more energy is sent in the direction of travel.

If you look closely at the diagram of a Yagi, you'll note that a Yagi is a dipole with a reflector behind it, and several directors in front of it, in the direction you want to signal to travel.

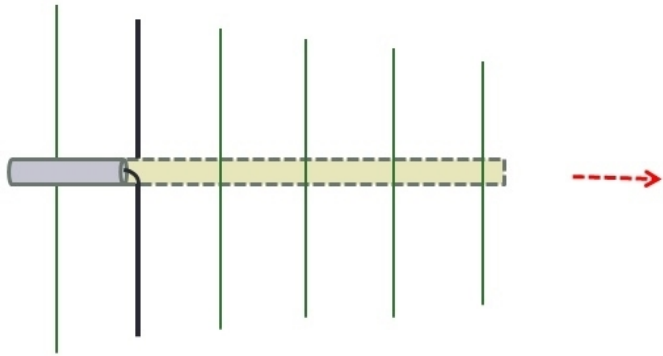
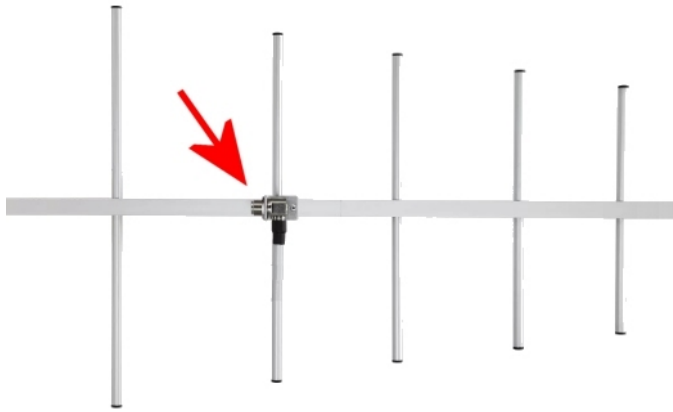
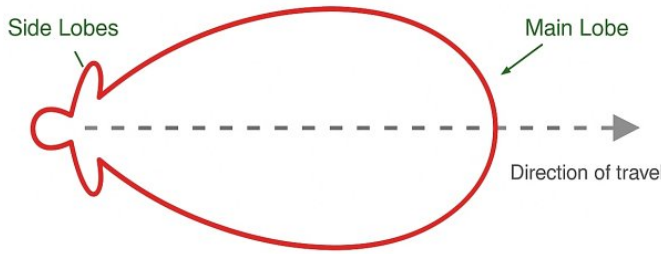


Diagram of a Yagi (beam) antenna when transmitting



Yagi (beam) antenna (the arrow indicates the "feed point")

Below is the polar pattern for the Yagi antenna:



Yagi polar pattern

4.4 Antenna Gain and ERP

Some antennas, such as the Yagi beam antennas, have “gain”. Just like a torch focuses light into a beam, so does the Yagi antenna.

The **Yagi antenna** focuses signals in one direction and has what's known as “gain”. This gain is expressed in Decibels (dB), relative to a half-wave dipole.

An antenna with a gain of 3dB would result in double the power being fed into it, being sent out in the direction of travel.

The following table, which is also in the 4-page exam booklet, gives the values that you are required to know at Foundation:

Antenna Gain	Multiplies the power by a factor of
3dB	x 2
6dB	x 4
9dB	x 8
10dB	x 10

This table is found in the 4-page exam booklet.

Effective Radiated Power (ERP)

ERP is a measurement of how much power an antenna is radiating. It's calculated by multiplying the power fed into the antenna (in watts) by the antenna gain.

ERP (watts) = power fed to the antenna x the antenna gain

ERP (watts) = power fed to the antenna			
10 watts			
60 watts			
90 watts			
100 watts			

EIRP

We've been talking about ERP. There is another way that antenna gain can be expressed: EIRP - “Effective Isotropic Radiated Power.” Here is the key difference:

- ERP (discussed above) is calculated by using the gain **relative to a half-wave dipole.**
- EIRP is a way of expressing antenna gain **relative to a theoretical antenna**

that radiates equally in all directions.

Antenna manufacturers often use EIRP as it shows a higher value than ERP, making the antenna gain look more appealing on paper.

10 watts EIRP would be the equivalent of 6.1 watts ERP. This number may be asked in the exam, as it's connected with something we cover later under "Licensing Conditions".

4.5 Polarisation

Antennas such as the dipole and the Yagi can be positioned to radiate their signals vertically or horizontally.

VHF and UHF signals will normally be received most effectively when the transmitter and the receiver have the same antenna polarisation (vertical or horizontal).

Antenna polarisation at HF is less important because the polarisation may change as a result of being refracted by the ionosphere – we cover this in more detail in the Propagation chapter.

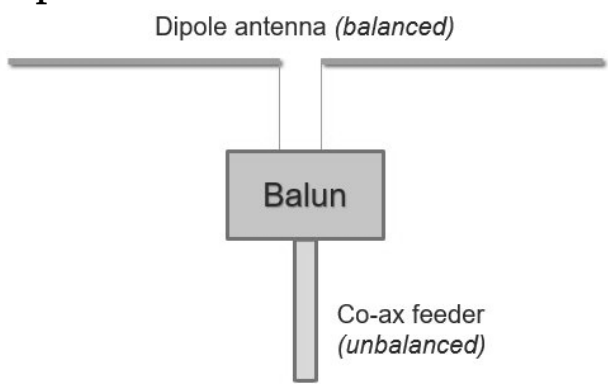
4.6 Baluns

When connecting an unbalanced feeder to a balanced antenna, you need to connect the two using something called a **Balun.** The

name is made up as follows: **BAL**anced to **UN**balanced = **BalUn.**

The Balun acts as an interface that separates the antenna system from the feeder cable, so that the feeder doesn't "radiate" or become part of the antenna system.

Not using a Balun can result in interference issues, as without one, RF energy will radiate down the screen of the coaxial cable and get back into the shack - at high power, this can be a real problem.



Dipole antenna connected to coaxial feeder.

A close-up photo of a Balun for use on HF

4.7 Impedance

The connection point from the feeder to the antenna is called the "feed point".

An antenna has an ‘impedance’ (measured in Ohms). You'll learn more about impedance at Intermediate, but you'll need to be aware of the concept of impedance for the Foundation exam.

The impedance of an antenna depends on the dimensions of the antenna, how it’s positioned and the wavelength of the applied signal.

Antennas are designed to be used on specific frequencies, and the feed point impedance of the antenna should ideally match the impedance of the feeder and the transmitter.

4.8 SWR (Standing Waves)

If the impedance of the antenna does not match that of the feeder, some energy will be reflected back from the antenna back down the feeder, creating 'Standing Waves' – the worse the match, the more energy gets reflected back to the transmitter.

An SWR (Standing Wave Ratio) meter tests whether there is a correct "match".

A Standing Wave Ratio of 1:1 is ideal (a good match).

High SWR at the transmitter (much greater than a ratio of 2:1) indicates a feeder or antenna mismatch, which may damage the transmitter.

An SWR meter showing an acceptable SWR reading

4.9 Matching

If there is a mismatch between the transmitter and antenna impedance, you would correct this using an **AMU** (Antenna Matching Unit). This is sometimes referred to as an **ATU** (Antenna Tuning Unit).

- You can buy manual (tuned by dials) or automatic AMUs.

- These can correct the mismatch (reducing the SWR ratio) to ensure no damage to the transmitter.
- The AMU is commonly used when working ‘multi-band’ (using a single antenna for multiple bands).

An automatic Antenna Matching Unit, showing transmit frequency, SWR, forward power (in watts) and reflected power.

5. Propagation

This section accounts for 2 marks out of 26 in the Foundation exam.

Radio waves normally travel in straight lines, but they can be refracted, diffracted and reflected.

Radio waves get weaker as they spread out.

5.1 The Ionosphere

The ionosphere comprises layers of ionised gases at heights between 70 and 400km above the Earth. The ionisation is caused mainly by ultraviolet rays from the sun.

On HF, most communication relies on the waves being refracted in the ionosphere.

VHF and UHF signals normally pass through the ionosphere.

HF signals are refracted off the ionosphere.

5.2 HF propagation

HF can provide worldwide propagation depending on how well the ionosphere refracts the waves back to the earth.

Propagation varies with frequency, time of day, seasons of the year, and solar activity.

A band is said to be ‘open’ when it supports skywave propagation via the Ionosphere.

5.3 VHF and UHF propagation

VHF and UHF signals normally take place within the troposphere situated below the ionosphere.

At VHF/UHF, the range decreases as frequency increases. In general, VHF/UHF waves have a range not much beyond line of sight.

The range achieved at VHF/UHF is dependent on antenna height, antenna gain, a clear path and transmitter power. Higher antennas are preferable to higher power as they improve both transmit and receive performance.

Outdoor antennas will perform better than indoor and loft antennas.

Hills cause radio shadows, and signals become weaker as they penetrate buildings.

Range:

The range of VHF and UHF signals can vary as follows:

Snow, hailstones and heavy rain can **reduce** the strength of signals at UHF and above. This is known as “attenuation”.

There are two conditions that can **increase** the range of VHF and UHF signals. These are covered in more detail at Intermediate, but they may come up in the Foundation exam:

- “Sporadic E” – One of the atmospheric layers is known as the “E” layer, and it behaves oddly in the Summer months, occasionally extending range, usually briefly
- “Atmospheric ducting” – signals can get trapped in some layers and get carried along further than normal.

6. Licence Conditions

This section accounts for 6 marks out of 26 in the Foundation exam.

This is the largest section of the exam, so it's worth making sure you study this section carefully.

You will also need to have the 4-page exam booklet with you whilst studying this section.

Radio Society of Great Britain
Advancing amateur radio since 1913

Reference Data
for use in the
Foundation Level Examination

What next:

Once your results arrive at RSGB HQ they will usually be processed after 6 working days have elapsed, then your official result will be posted to you and uploaded to the Ofcom system. Results are not available any sooner.

To obtain your licence please log on to the Ofcom website www.ofcom.org.uk and follow the online instructions.

Queries:

Invigilators are not permitted to explain or comment on questions but you may draw their attention to any question you believe is wrong. Please do that before you submit your answers to allow the question number to be noted.

You may also comment on any aspect of the examination, either to the invigilators or
to the RSGB Examinations Office exams@rsgb.org.uk. All comments should be received within 5 days of the examination.

All comments are dealt with in strict confidence.

Available from www.sxham.uk/ex307

As a reminder, the UK amateur radio licence is for self-training in radio communications and is of a non-commercial nature.

Business use and commercial advertising are not permitted.

6.1 Ofcom

Ofcom is the UK's TV and radio regulator, and they issue our amateur radio licences.

You must give immediate notice to Ofcom of any change to your name, main station address or mailing address.

You must confirm that the details shown on the licence are valid at least once every five years.

Ofcom has the right to inspect your station or ask you to modify your equipment, close down or restrict your operating.

Ofcom can revoke your licence for breaches of licence conditions.

Ofcom may require you to keep a log of all transmissions made over a specified period of time to help with interference issues.

As a radio amateur, Ofcom requires that you do not cause undue interference to other radio users.

6.2 Operating Locations

Operation is permitted in and over the UK, Channel Islands and Isle of Man, including their territorial seas.

Operation on ships and aircraft registered in the UK, Channel Islands and Isle of Man is permitted in international waters or airspace. The Licensee may operate the Radio equipment only with the agreement of the captain or the person for the time being in control of the ship or aircraft.

Transmitting from an aircraft is only permitted at low power and is not permitted on all bands. Check the Foundation Schedule in the 4-page exam booklet for restrictions that apply when airborne.

The Foundation licence does not permit use in other countries, their territorial waters or airspace. Other Administrations (e.g. regulators in foreign countries) do not routinely recognise the Foundation Licence, but some countries may make exceptions.

6.3 Callsigns

Callsigns are used to identify you on-air, and each callsign is unique to one person. They are assigned to you by Ofcom as part of your amateur radio licence.

The first part of the callsign shows the country and licence level, as shown in the table below.

The last 3 letters (e.g. “ABC”) are unique to each person.

The UK amateur radio callsign structure is as follows:

Prefix(es)	Example callsign
M0, 2E0	M0ABC
M1, 2E1	M1ABC
M3, 2E3	M3ABC
M5, 2E5	M5ABC
M6, 2E6	M6ABC
M7, 2E7	M7ABC
M8, 2E8	M8ABC
M9, 2E9	M9ABC
2E0	2E0ABC
2E1	2E1ABC
2E3	2E3ABC
2E5	2E5ABC
2E6	2E6ABC
2E7	2E7ABC
2E8	2E8ABC
2E9	2E9ABC

Licence level	Callsign prefixes
FOUNDATION	M3, M6, M7, M8, M9, 2E3, 2E6, 2E7, 2E8, 2E9
INTERMEDIATE*	M0, M1, M5, 2E0, 2E1, 2E5
FULL	G1, G2, G3, G4, G5, G6, G7, G8, M1, M5

** For more on 2x0 and 2x1, see “Callsign Quirks” in the next section*

For the Foundation exam, you will need to know the three different licence levels and may be required to identify the licence level from one of the above callsigns.

For Information: The following notes on callsigns are not examinable, but may be helpful when you get started in the hobby:

- You’ll notice we use the symbol Ø, not 0, in this section. Sometimes callsigns are written using this symbol to prevent confusion. For example, a Full callsign would be identified on air as “M zero ABC” (it’s the number ‘zero’, not ‘nought’ or the letter ‘o’)

- When you get your Foundation licence, you can choose your callsign on the Ofcom website. You can choose from any prefix in the Foundation range, and choose your 3-letter suffix as long as it's not already been taken.
- Most callsigns end with three letters, but some (especially older ones), have just two letters
- Callsigns beginning with "GB" represent a special event station or a special unique location. For example, the National Radio Centre at Bletchley Park has the callsign GB3RS
- Amateur radio clubs can have their own callsigns, for example, Essex Ham's club callsign is MXØSXA
- Ofcom's rules changed in 2024, making it easier for people to change their callsign, and phasing out the clunky 2xØ and 2x1 callsign series used for Intermediate

6.4 Regional Secondary Locators

These are optionally used to indicate which region an amateur radio station is transmitting from.

These are the regional secondary locators you are required to remember for your Foundation exam:

Region	Examples
England	2EØABC
Scotland	2MØABC
Wales	2WØABC
Northern	2IØABC
Isle of Ma	2DØABC
Jersey	2JØABC
Guernsey	2UØABC

** For the Isle of Man, "D" is for "Douglas" (the capital city). U is the second letter of Guernsey. No one seems to know why Scotland is "M", but for some it helps to think that many common Scottish names begin with "Mc", e.g. McDonald, McIntyre, McKenzie, etc*

Use of Regional Secondary Locators is optional, except for a 2x Intermediate callsign, where the regional letter is mandatory.

Callsign quirks

There are some unusual quirks with UK callsigns that might be worth knowing:

1. Until late 2025, the callsigns issued for Intermediate started with 2xØ or 2x1, with x being the secondary locator – So

for instance, 2M0ABC would be an Intermediate transmitting from Scotland. From late 2025, new Intermediate callsigns issued by Ofcom begin M8 or M9, with many amateurs swapping from 2xØ to M8 or 2x1 to M9.

2. When operating from England, an ‘E’ can optionally be used with an M or G callsign, for example, “ME7ABC”. This was only introduced in 2024 and is not very common, with the format M7ABC being far more common in England.

6.5 Callsign Suffixes

Suffixes can optionally be used at the end of a callsign, typically to let others know about your type of operation.

You can use any suffix, as long as it is not offensive and does not obscure correct identification.

The four common suffixes are as follows:

Suffix	Meaning
/M	Mobile, pedestrian or on inland waters
/A	Alternative Postal Address: Friend's house, hotel
/P	Temporary: Field event with no postcode
/MM	Maritime Mobile (Vessel at sea)

When using a suffix on-air, you would typically say "MM7ABC stroke M" or "MM7ABC slash M".

6.6 Using your callsign

The licence states that you must use your callsign "as frequently as practicable" so that your station is "clearly identifiable at all times" and in an "appropriate format consistent with the mode of operation".

It's advisable to give your callsign when calling CQ *(looking for a general contact)*, when making contact with an amateur, when you change frequency, when you change mode,

when there is a change of Regional Secondary Locator, or if there is a supervision change.

6.7 Supervision

As a licensed radio amateur, you can let other people transmit using your callsign under your “direct supervision”. This could be another radio amateur, or perhaps someone who wants to give amateur radio a try before they think about getting their own amateur radio licence.

The Ofcom licence uses the term “using the Radio Equipment”, but in practice, this doesn’t refer to who actually owns the equipment – instead, it refers to how the transmitting station is being identified (i.e. the callsign that is being used on-air).

If you are letting someone else transmit with your equipment using your callsign under your direct supervision, the license states that you, as the licence-holder:

a) Must ensure all users are made aware of and comply with the terms, conditions and limitations of the Licence; and
b) Remain responsible for the operation of the Radio Equipment and compliance with the terms, conditions and limitations of the Licence

In certain circumstances (for example: a disaster, emergency, operation or related exercise), licenced amateurs may allow the equipment to be used by a member of a User Service to assist with communication.

What's a User Service?

You don't need to remember these for the exam, but they are: 'Category 1' emergency services and 'Category 2' responders, the British Red Cross, St John Ambulance, St Andrew's Ambulance Association, the Royal Voluntary Service, the Salvation Army and any Government Department.

6.8 Messages

You can only send messages to other amateur radio stations.

Transmitting for general reception (or "broadcasting to anybody who may be listening") is not permitted, other than for CQ calls or 'nets'.

A 'Net' (short for network) refers to a conversation with three or more amateurs, as long as communication is first established separately with at least one amateur in any such group.

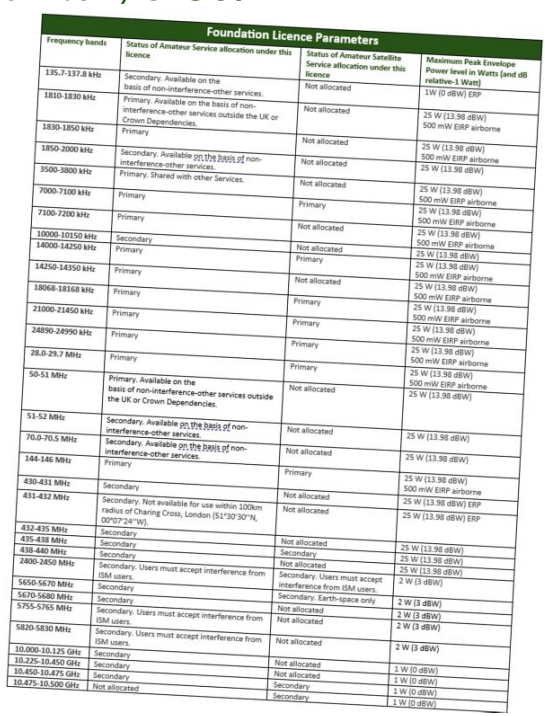
Encryption, or secret codes that obscure the meaning of a message, is not permitted, except under specific circumstances (such as if requested by a User Service, or for control of amateur radio satellites). Morse code is not a secret code, so it is permitted.

Nets are a popular way to keep in touch with local amateurs in your area, and many amateur radio clubs run regular nets. When you've got your licence, listen in to local nets and when you're ready, join in.

6.9 Parameters Table

You will be required to look up frequencies on the Foundation Schedule. This can be found on page 2 of the 4-page exam booklet, which you should print out and use for your studies and revision. This can be taken into your exam and should be used when taking mock exams too.

It is available to download and print from www.sxham.uk/ex307



Foundation Licence Parameters			
Frequency bands	**Status of Amateur Service allocation under this licence**	**Status of Amateur Satellite Service allocation under this licence**	**Maximum Peak Envelope Power level in Watts (and dB relative-1 Watt)**
135.7-137.8 kHz	Secondary. Available on the basis of non-interference-other services.	Not allocated	1W (0 dBW) ERP
1810-1830 kHz	Primary. Available on the basis of non-interference-other services outside the UK or Crown Dependencies.	Not allocated	25 W (13.98 dBW) 500 mW EIRP airborne
1830-1850 kHz	Primary	Not allocated	25 W (13.98 dBW) 500 mW EIRP airborne
1850-2000 kHz	Secondary. Available on the basis of non-interference-other services.	Not allocated	25 W (13.98 dBW)
3500-3800 kHz	Primary. Shared with other Services.	Not allocated	25 W (13.98 dBW) 500 mW EIRP airborne
7000-7100 kHz	Primary	Primary	25 W (13.98 dBW) 500 mW EIRP airborne
7100-7200 kHz	Primary	Not allocated	25 W (13.98 dBW) 500 mW EIRP airborne
10000-10150 kHz	Secondary	Not allocated	25 W (13.98 dBW)
14000-14250 kHz	Primary	Primary	25 W (13.98 dBW) 500 mW EIRP airborne
14250-14350 kHz	Primary	Not allocated	25 W (13.98 dBW) 500 mW EIRP airborne
18068-18168 kHz	Primary	Primary	25 W (13.98 dBW) 500 mW EIRP airborne
21000-21450 kHz	Primary	Primary	25 W (13.98 dBW) 500 mW EIRP airborne
24890-24990 kHz	Primary	Primary	25 W (13.98 dBW) 500 mW EIRP airborne
28.0-29.7 MHz	Primary	Primary	25 W (13.98 dBW) 500 mW EIRP airborne
50-51 MHz	Primary. Available on the basis of non-interference-other services outside the UK or Crown Dependencies.	Not allocated	25 W (13.98 dBW)
51-52 MHz	Secondary. Available on the basis of non-interference-other services.	Not allocated	25 W (13.98 dBW)
70.0-70.5 MHz	Secondary. Available on the basis of non-interference-other services.	Not allocated	25 W (13.98 dBW)
144-146 MHz	Primary	Primary	25 W (13.98 dBW) 500 mW EIRP airborne
430-431 MHz	Secondary	Not allocated	25 W (13.98 dBW) ERP
431-432 MHz	Secondary. Not available for use within 100km radius of Charing Cross, London (51°30'30"N, 00°07'24"W).	Not allocated	25 W (13.98 dBW) ERP
432-435 MHz	Secondary	Not allocated	25 W (13.98 dBW)
435-438 MHz	Secondary	Secondary	25 W (13.98 dBW)
438-440 MHz	Secondary	Not allocated	25 W (13.98 dBW)
2400-2450 MHz	Secondary. Users must accept interference from ISM users.	Secondary. Users must accept interference from ISM users.	2 W (3 dBW)
5650-5670 MHz	Secondary	Secondary. Earth-space only	2 W (3 dBW)
5670-5680 MHz	Secondary	Not allocated	2 W (3 dBW)
5755-5765 MHz	Secondary. Users must accept interference from ISM users.	Not allocated	2 W (3 dBW)
5820-5830 MHz	Secondary. Users must accept interference from ISM users.	Not allocated	2 W (3 dBW)
10.000-10.125 GHz	Secondary	Not allocated	1 W (0 dBW)
10.225-10.450 GHz	Secondary	Not allocated	1 W (0 dBW)
10.450-10.475 GHz	Secondary	Secondary	1 W (0 dBW)
10.475-10.500 GHz	Not allocated	Secondary	1 W (0 dBW)

Example only – Download the 4-page booklet, or see Appendix A for a sample of the exam booklet material

Using the Parameters table:

Column 1: The frequencies available at Foundation.

Column 2: "Primary" means that radio amateurs are the main users. "Secondary" indicates that another service is the "Primary" user and that the Primary user allows radio amateurs to use the frequencies.

Column 3: Whether each frequency range can be used for amateur radio satellite use (also with Primary and Secondary allocation listed)

Column 4: The maximum allowed transmit power.

[illegible]	[illegible]	
basis of non-interference-other services outside the UK or Cro		
[illegible]	[illegible]	
[illegible]	[illegible]	
[illegible]	[illegible]	
500 mW EIRP airborne		
[illegible]	[illegible]	
[illegible]	[illegible]	
(51°30’30”N, 00°07’24”W).		
[illegible]	[illegible]	

Things to look out for on the Foundation Parameters table include:

- Some frequencies, such as 430-432MHz, have a maximum power limit in ERP
- 431-432MHz cannot be used within a 100km radius of London's Charing Cross
- Frequencies of 2400MHz and above have low power limits
- 135.7-137.8kHz are low power and with an ERP restriction

Remember to get familiar with the 4-page exam booklet. We have a video exploring this booklet in detail, which you will find at: www.sxham.uk/trainvids

6.10 EMF rules

The licence requires that our equipment must not expose the public to EMF (Electromagnetic fields) over agreed limits.

This applies to transmitted power levels over 10 Watts EIRP (radiated power relative to a theoretical antenna), which is calculated as 6.1 Watts ERP (effective radiated power). We discuss ERP and EIRP under “Feeders and Antennas”, but remember these two numbers for your exam.

“The public” includes neighbours, visitors, family members, as well as people at field events.
All amateurs are required to complete an assessment and keep a record of the assessment that Ofcom may ask to see.

If the assessment shows a potential risk, appropriate steps must be taken to ensure transmissions are kept below the limits.

If there is no further action required, the reason must be stated (e.g. “Power levels are below the threshold”).

How do I complete an EMF assessment?

The exam doesn’t ask you to go into any detail about how to complete an assessment, but you would typically use the EMF Calculator that has been created by the RSGB. You put details about your antenna and power, and it produces an assessment showing safe distances.
We have a video on how to complete an assessment. See ***www.sxham.uk/emf***

7. EMC

This section accounts for 3 marks out of 26 in the Foundation exam.

Electromagnetic compatibility (EMC) is the avoidance of interference between various pieces of electronic equipment.

“Immunity” is the ability of any piece of equipment to function correctly in the presence of strong RF signals.

7.1 Causes of Interference

Transmitters can cause interference to nearby electronic and radio equipment. Receivers can also suffer from interference from local and other sources.

The more power a station runs, the more likely it is to cause interference.

Some types of transmission are more likely to cause interference to radio, television and telephones than others.

AM and SSB modes are the most likely types of transmission to cause problems. FM and some of the HF data modes are least likely to cause problems (for the exam, remember “Friendly Modulation”).

Interference can occur due to nearby radio transmissions being conveyed to the affected equipment through:

- the home’s mains wiring,
- TV aerial leads,

- speaker leads,
- telephone wiring and,
- by direct pick-up in the equipment's internal circuitry (particularly at VHF/ UHF frequencies).

Possible points of entry for RF interference

7.2 Reducing interference

The immunity of most types of equipment can be increased by fitting suitable filters or 'chokes' in mains or antenna leads.

Filters should be fitted as close to the affected device as possible.

Interference problems can be minimised by siting antennas as far away from houses as possible, as high as possible, and using balanced antennas at HF.

At HF, horizontal dipoles are less likely to be a problem than other antenna types. End-fed wires can present significant EMC problems.

Information on avoiding interference can be obtained from the RSGB's EMC team, from experienced radio amateurs online or at local clubs.

7.3 Dummy loads

A dummy load is a screened resistor of the correct value and with a suitable power rating. These can be connected to the output of a transmitter instead of an antenna, to allow the transmitter to be operated without radiating a signal.

Transmitting into a dummy load is a good test for any unwanted RF being conducted out of the transmitter along its power supply leads, any connected interface leads and into the mains.

A dummy load

7.4 RF earths

The function of the RF earth connection in an amateur station is to provide a path to ground to minimise RF currents entering the mains earth system and causing interference to other electronic equipment.

7.5 EMC in cars

It is the vehicle owner's responsibility to ensure that any radio installation is compatible with the vehicle's electrical and management systems and does not affect vehicle safety.

Professional advice should be sought for all vehicle installations. The installation of amateur radio equipment may have to be disclosed to the vehicle insurers.

Any tests following mobile radio equipment installation should be

done with the vehicle stationary, with all vehicle electronic systems operating before any on-road tests are carried out.

Vehicle ignition and battery charging systems can cause electrical interference to reception on mobile radio equipment.

7.6 Handling interference complaints

Interference from your amateur radio station has the potential to cause neighbour disputes. In such cases, it's worth conducting tests in cooperation with the person who's complaining.

Keeping a transmission log can be of help when dealing with complaints of interference. If you and the person complaining keep a log, you can confirm whether or not it's you who is causing the interference.

If you need advice on resolving interference, the RSGB produces EMC and Interference information leaflets. Remember that advice is available from the RSGB EMC Committee.

Your neighbour can potentially get Ofcom involved with cases of interference (a callout fee may apply). If you are found to be causing interference, Ofcom has the power to require modification, make restrictions, or even shut down your station.

8. Safety

This section accounts for 3 marks out of 26 in the Foundation exam.

Remember that safety is **everybody's** responsibility, and you must be alert to any potentially unsafe circumstance. This applies to your own station setup, when entertaining visitors, when operating "portable", and at club events.

If you see something unsafe, warn others and report the matter to the appropriate person. If you are unsure about any potential safety issue, seek advice.

8.1 Electrical safety

High voltages carry a risk of electrocution, and high currents carry a risk of overheating and fire.

Where a safety earth has been fitted, it must not be removed.

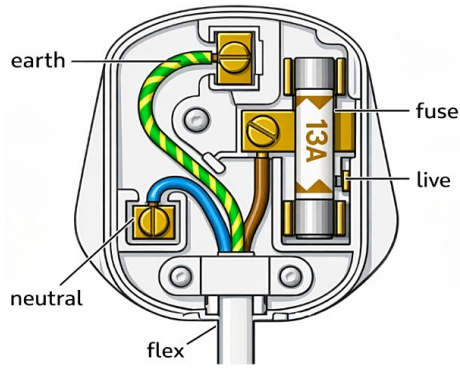
Special care is needed with earthing arrangements, and a competent professional must be consulted prior to making any modifications.

You are required to know how to wire a UK mains plug. The colours are as follows**:**

LIVE: Brown

NEUTRAL: Blue

EARTH: Green and Yellow



Inside a UK mains plug

Check for the correct value fuse, make sure the flex is secured, and watch for “whiskers” (small strands of metal).

Contact with both Live and Neutral may result in a fatal injury.

You should only work inside equipment with the power sources disconnected. It is important to follow the manufacturer's instructions for servicing equipment.

8.2 Fuses

A fuse is a safety device that contains a thin wire designed to melt (breaking the circuit) when an excessive current flows through the fuse.

Mains fuses must be fitted in accordance with the manufacturer's instructions.

The reason for a blown fuse needs to be properly investigated.

A Residual Current Circuit Breaker with Overcurrent (RCBO) will offer better protection against a shock than a standard fuse. An RCBO will detect currents to earth of about 30mA, whereas a fuse

will only blow at several amps and only when the fault is a short circuit (e.g. Live-to-Neutral, or Live-to-Earth).

8.3 Station safety

All equipment should be controlled by a clearly marked master “off” switch, and its location should be made clear to everyone in the property. In the event of an accident or fire involving electricity, the first action is to switch off the power. Any casualty must not be touched unless the power has been switched off.

Make sure you don’t have wires trailing across the floor, such as mains cables, coaxial cable, and headphone cables (as they are trip hazards), and watch for other trip hazards and the risk of frayed insulation.

When listening using headphones, be aware that listening at excessive volume can cause hearing damage, and the damage can be cumulative.

Operating outdoors can introduce new hazards, such as temporary power arrangements, trailing cables and damp ground. Extra safety precautions should be taken whilst operating outdoors, such as completing a risk assessment, care with routing cables, correct fusing and use of RCBOs.

8.4 Battery safety

Some batteries can supply very high currents, which can be hazardous if short-circuited.

With rechargeable batteries, charging must be in accordance with the manufacturer’s instructions. Different battery technologies require different charging techniques and must use the correct type of charger. Lithium batteries in particular can cause fire and explosion if not properly treated.

8.5 Tool safety

Eye protection must be worn when using tools to prevent damage

from small metal particles, known as swarf. Eye protection must be worn when soldering to prevent solder or flux from splashing into the eyes.

All tools, including power tools, can be hazardous and should be handled with care and appropriate precautions taken.

When using a soldering iron, a soldering-iron stand must be used to avoid skin contact with the hot bit of the iron when not in use. The area must be well-ventilated to avoid inhalation of solder fumes, which can cause breathing problems, particularly for asthmatics.

8.6 Antenna safety

Particularly high antennas may need special protection against lightning. Your local authority building department may be able to offer advice.

Elevated wires, masts and antennas must be suitably located and secured.

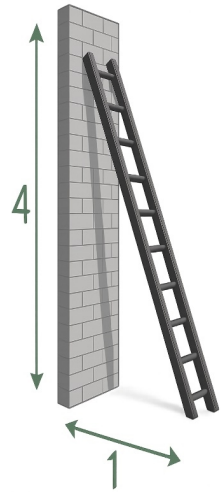
Antennas and feeders must not be sited close to overhead power cables.

A lethal electric shock can result from antennas and ladders coming into contact with or attracting arcing from overhead lines.

8.7 Working at height

Putting up antennas is potentially hazardous. It is advisable to have someone to help you. At least one adult should be present.

A ladder should be used at the correct angle (4:1 height-to-base ratio).



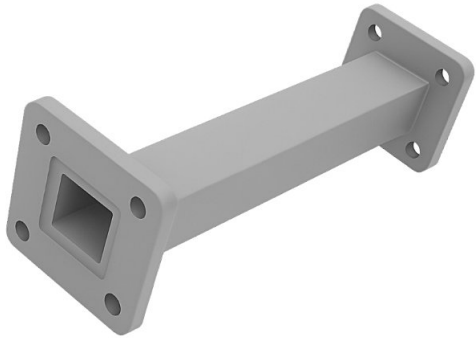
Ladders must be adequately secured to prevent them from slipping. You must not “overreach” from a ladder, as this increases the risk of falling.

When working at height, a tool belt or similar device to carry tools should be used, as this may help to prevent falling objects. Hard hats should be worn when you or others are working at height.

8.8 Working with RF

The main health effect of exposure to electromagnetic radiation is the heating of body tissue. Note that eyes are particularly susceptible to damage. Guidance on safe levels of RF radiation is available from various government and international bodies, the Health Security Agency and the International Commission on Non-Ionising Radiation Protection (ICNIRP).

A waveguide is a device that focuses radio waves, typically at microwave frequencies. Looking down a waveguide, or standing too close to high-gain antennas whilst in use, can be dangerous.



A waveguide

Antenna elements and other conductors carrying RF should not be touched whilst transmitting.

Antennas should be mounted so that people will not come into accidental contact with them.

9. Operating Procedures

This section accounts for 3 marks out of 26 in the Foundation exam.

9.1 VHF calling

Here is an example of how to make a call on 2m (VHF):

- Tune to the “FM Calling” frequency of 145.500MHz.
- Before calling, you need to listen to the frequency to make sure it’s not in use by someone else.
- If not in use, you can call for a specific callsign, or call “CQ”.
- Once you’ve established contact with someone, you need to move off the calling frequency so that others can use it. Look for a free frequency.
- Listen to make sure the frequency is not

in use by another user (or another mode), then put out a call to ask, “Is the frequency in use?”

- If the frequency is free, go back to “FM Calling”, call your contact, and send them to the new frequency.

For a video of an example contact, go to:
www.sxham.uk/trainvids

9.2 Signal reports

Signal reports are given using RST codes: Readability, Strength, and Tone.

A signal report of “Five and Nine” would be totally readable and very strong.

Readability		
How readable is the signal? (Is there interference?)	*How strong is the signal? (Is there fading?)*	*Is the tone of the signal musical or rough?*
1 = Unreadable	1 = Faint signals	
3 = Readable with difficulty	5 = Moderately strong signals	
5 = Perfectly readable	9 = Very strong signals	

Radio receiver, showing a received signal strength of 9

9.3 Callsign Suffixes:

You can optionally add a suffix to the end of your callsign to tell others about your operating conditions.

Here are the four common suffixes to remember for your exam:

Suffix	Meaning
/M	Mobile, pedestrian, or on inland waters
/A	Temporary Postal Address: Friend's house, hotel
/P	Temporary: Field event with no postcode
/MM	Mobile (Vessel at sea)

On-air, you would commonly say "M7ABC stroke P" or "M7ABC slash P". Remember that suffixes must not be offensive or used to obscure your identification.

9.4 Phonetic Alphabet

Commonly used on HF, where it can be harder to hear signals. Potentially tested on the exam:

								V

Whiskey						W
X-ray						X
Yankee						Y
Zulu						Z
Tango						
Uniform						

9.5 Logs

Logs are not mandatory, but they are good practice, helpful for contests and awards, and for confirming contacts.

You can use logging apps, online services or paper logs.

You typically log: Callsign, Date, Time, Frequency and Mode. Logging is done in UTC, also known as GMT (so that overseas logs match).

Ofcom can mandate logging to help identify interference and compliance issues.

Example of a paper logbook for use "in the field"

9.6 Bad behaviour

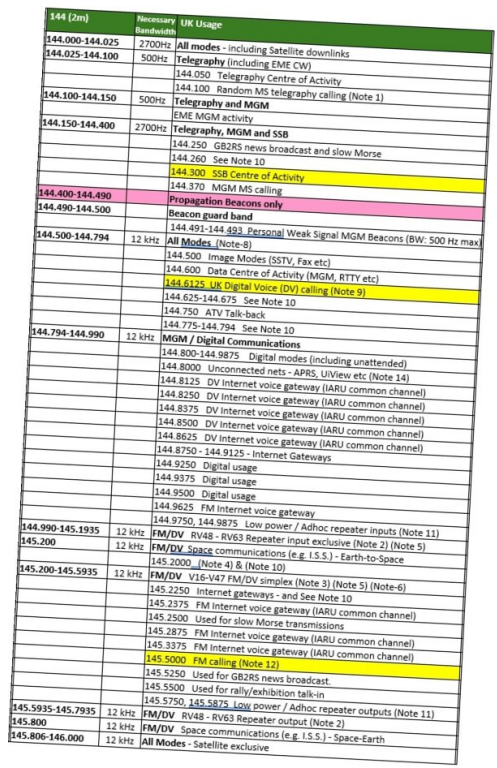
Transmitting music and the use of offensive or threatening language whilst on the air are unacceptable.

Don't respond to any abuse you may encounter, and don't confront

the perpetrator. If abuse is persistent, keep a log.

9.7 Band plans

A band plan helps ensure fair use among radio operators. For the exam, you will find the 2m (144MHz) and 20m (14MHz) band plans in the 4-page exam booklet.



144 (2m)	Necessary Bandwidth	UK Usage
144.000-144.025	2700Hz	**All modes** - including Satellite downlinks
144.025-144.100	500Hz	**Telegraphy** (including EME CW)
		144.050 Telegraphy Centre of Activity
		144.100 Random MS telegraphy calling (Note 1)
144.100-144.150	500Hz	**Telegraphy and MGM**
		EME MGM activity
144.150-144.400	2700Hz	**Telegraphy, MGM and SSB**
		144.250 GB2RS news broadcast and slow Morse
		144.260 See Note 10
		144.300 SSB Centre of Activity
		144.370 MGM MS calling
144.400-144.490		**Propagation Beacons only**
144.490-144.500		**Beacon guard band**
		144.491-144.493 Personal Weak Signal MGM Beacons (BW: 500 Hz max)
144.500-144.794	12 kHz	**All Modes** (Note-8)
		144.500 Image Modes (SSTV, Fax etc)
		144.600 Data Centre of Activity (MGM, RTTY etc)
		144.6125 UK Digital Voice (DV) calling (Note 9)
		144.625-144.675 See Note 10
		144.750 ATV Talk-back
		144.775-144.794 See Note 10
144.794-144.990	12 kHz	**MGM / Digital Communications**
		144.800-144.9875 Digital modes (including unattended)
		144.8000 Unconnected nets - APRS, UiView etc (Note 14)
		144.8125 DV Internet voice gateway (IARU common channel)
		144.8250 DV Internet voice gateway (IARU common channel)
		144.8375 DV Internet voice gateway (IARU common channel)
		144.8500 DV Internet voice gateway (IARU common channel)
		144.8625 DV Internet voice gateway (IARU common channel)
		144.8750 - 144.9125 - Internet Gateways
		144.9250 Digital usage
		144.9375 Digital usage
		144.9500 Digital usage
		144.9625 FM Internet voice gateway
		144.9750, 144.9875 Low power / Adhoc repeater inputs (Note 11)
144.990-145.1935	12 kHz	**FM/DV** RV48 - RV63 Repeater input exclusive (Note 2) (Note 5)
145.200	12 kHz	**FM/DV** Space communications (e.g. I.S.S.) - Earth-to-Space
		145.2000 (Note 4) & (Note 10)
145.200-145.5935	12 kHz	**FM/DV** V16-V47 FM/DV simplex (Note 3) (Note 5) (Note-6)
		145.2250 Internet gateways - and See Note 10
		145.2375 FM Internet voice gateway (IARU common channel)
		145.2500 Used for slow Morse transmissions
		145.2875 FM Internet voice gateway (IARU common channel)
		145.3375 FM Internet voice gateway (IARU common channel)
		145.5000 FM calling (Note 12)
		145.5250 Used for GB2RS news broadcast.
		145.5500 Used for rally/exhibition talk-in
		145.5750, 145.5875 Low power / Adhoc repeater outputs (Note 11)
145.5935-145.7935	12 kHz	**FM/DV** RV48 - RV63 Repeater output (Note 2)
145.800	12 kHz	**FM/DV** Space communications (e.g. I.S.S.) - Space-Earth
145.806-146.000	12 kHz	**All Modes** - Satellite exclusive

Example of the 2m band plan. Download and print out the 4-page booklet, or see Appendix A for a sample of the exam booklet material

Using the band plans

You may be asked questions about items in those two band plans.

Some things to watch for in the band plans:

- Narrow modes (CW & data) are mostly near the lower frequencies within each band.
- Sideband: Below 10MHz, Lower Sideband (LSB) is normally used, and over 10MHz, Upper Sideband (USB) is normally used.
- “Centre of Activity” is where to start looking for contacts on a specific mode, for example, 144.300MHz is the Centre of Activity for SSB on the 2m band.
- Watch the exceptions: Beacons, repeater input and output frequencies, and space-only frequencies.

Extracts from the 2m (144MHz) band plan:

Mode(s)	Bandwidth
144.025	Including Satellite downlinks
144.100	Telegraphy (including EME CW)
144.050	Telegraphy Centre of Activity
144.100	Random MS telegraphy calling (Note 1)
144.150	Telegraphy and MGM
EME MGM activity	
144.150	Telegraphy, MGM and SSB
144.250	GB2RS news broadcast and slow Morse
144.260	See Note 10

144.300	SSB Centre of Activity
144.370	MGM MS calling
144.400-144.500	**Propagation Beacons only**
144.400-144.500	**Beacon Band**
144.491-144.493	Personal Weak Signal MGM Beacons (BW: 500 Hz m

145.200-145.5935	FM/DV simplex (Note 3) (Note 5) (Note 6)
145.2250	Internet gateways - and See Note 10
145.2375	FM Internet voice gateway (IARU common channel)
145.2500	Used for slow Morse transmissions
145.2875	FM Internet voice gateway (IARU common channel)
145.3375	FM Internet voice gateway (IARU common channel)
145.5000	FM calling (Note 12)
145.5250	Used for GB2RS news broadcast.
145.5500	Used for rally/exhibition talk-in
145.5750, 145.5875	Low power / Adhoc repeater outputs (Note 11)
145.6000-145.7935	145.7935 Repeater output (Note 2)
145.800	Space communications (e.g. I.S.S.) - Space-Earth
145.800-146.000	Satellite exclusive

Remember to get familiar with the 4-page exam booklet. We have a video that explores this booklet in detail, which you can find at: sxham.uk/trainvids

9.8 Frequencies

Radio frequency bands are allocated for a particular use, such as broadcasting, aeronautical, maritime and amateur radio. Some amateur bands are shared with, or adjacent to, other spectrum users.

In the exam, you may be asked to identify other spectrum users from the table found in the 4-page exam booklet.

Frequency Allo	
Frequency (MHz)	Use
87.5 - 108.0	Broadcasting
108.0 - 117.975	Aeronautical Radionavigation
117.975 - 137.0	Aeronautical Mobile
137.0 - 138.0	Space Operations & Space Research
138.0 - 144.0	Land Mobile
144.0 - 146.0	Amateur & Amateur Satellite
146.0 - 149.9	Mobile (except aeronautical mobile)
149.9 - 150.05	Radionavigation-Satellite
150.05 - 152.0	Radio Astronomy
152.0 - 156.0	Land Mobile
156.0 - 158.525	Maritime Mobile
158.525 - 160.6	Land Mobile
160.6 - 160.975	Maritime Mobile

Example – Refer to the full table in the 4-page exam booklet

For the exam, you will need to be able to recognise the frequency bands for HF, VHF and UHF:

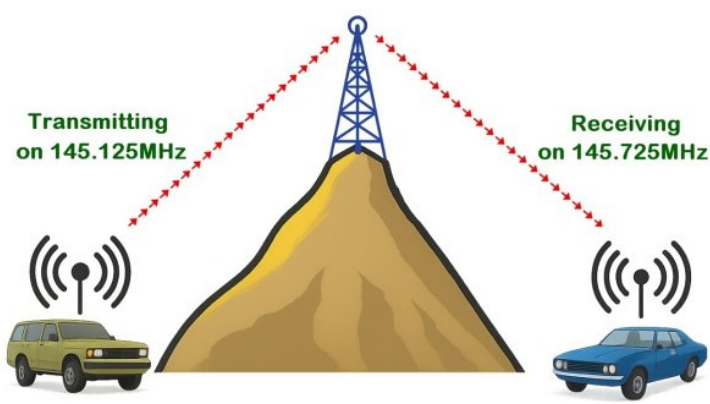
HF (High Frequency):	
VHF (Very High Frequency):	
UHF (Ultra High Frequency):	

9.9 Repeaters

There are hundreds of amateur radio repeaters around the UK, available for use by amateurs to extend the range of transmissions. They are often run by local clubs or repeater groups. There are also 'gateways' that act like repeaters, but connect around the world using the Internet.

Repeaters have an "input" and an "output" frequency, so that they can transmit and receive at the same time. You don't need to remember this for the exam, typically (but not always):

- 2m (VHF) repeaters transmit 600kHz above their input frequency.
- 70cms (UHF) repeaters transmit 1.6MHz or 7.6MHz below the input frequency.



Example of VHF repeater input and output operation

Most analogue voice repeaters use **CTCSS tones** – these are low-frequency tones that are transmitted as part of your audio. Repeaters will only activate if they 'hear' the correct CTCSS tone. This is to stop the repeater from transmitting if it 'hears' random transmissions of interference. There are nine blocks of tones used in the UK (identified by letters) so that frequencies can be shared across the UK. You must program your radio to transmit the right CTCSS tone for each repeater.

Many repeaters have "timeouts" to cut down on long transmissions (typically transmissions over a few minutes). After someone stops transmitting, listen for a short reset tone or similar noise before you start transmitting. This tone resets the repeater timeout.

It is common for amateurs to store repeater settings into memory on their radios – when storing into memory, you can save the frequency, offset and CTCSS tone (often with a short name), for ease of access.

Check the band plan to make sure that you don't have normal two-way (simplex) chats on frequencies that are intended for repeater use.

9.10 Digital Voice and Data

So far, we have focused on analogue radios and repeaters, but there are several Digital Voice (DV) and Digital Data (DD) modes available. These can be used for person-to-person contact, or via the various digital repeaters and gateways around the UK, which are

often connected to each other via the Internet to allow regional or national ‘group’ connectivity.

The common DV systems are **D-Star** (used by the manufacturer iCom), **C4FM Fusion** (used by Yaesu) and **DMR** (used by multiple manufacturers). These different systems are not usually compatible with each other, and appropriate radio equipment is needed for each of these systems.

DV radios often have a software setting that embeds the callsign or a unique ID in the transmission, and this may need to be changed if you are using borrowed equipment.

As some VHF/UHF frequencies support both digital and analogue modes, you should check that the channel is not in use by other modes. You should be aware that, as Digital (DV) radios often can’t hear analogue signals (and vice versa), such checks aren’t reliable.

If using data modes, you will likely be connecting input devices other than a microphone to your radio. Connecting anything other than the supplied microphone to the transmitter requires the correct operation of the PTT (Push to Talk). Audio signals need to be correct to prevent distortion or interference.

9.11 Satellites

There are dozens of amateur radio satellites in orbit – some are used as voice repeaters, some act as orbiting beacons, and some transmit messages or images. There’s also the International Space Station (ISS) that frequently transmits images, supports school contacts and acts as a packet (data) repeater.

Amateur satellites operate in allocated frequencies within the bands. As an example, take a look at the 2m band plan – you will see this entry:

FM/DV Space communications (e.g. I.S.S.) - Space-E	**145.800MHz**	

You should not use satellite or space frequencies for non-satellite operating (which is known as Earth-Earth, or ‘terrestrial’ operation)

9.12 International Operating

The ‘Licence Conditions’ chapter of this guide covers where you can operate, but as a reminder, the Foundation licence allows you to transmit from the United Kingdom, the Channel Islands and the Isle of Man, the territorial sea.

You can’t operate from other countries. For the exam, remember that other Administrations (regulators in foreign countries) do not routinely recognise the UK’s Foundation Licence, although some countries may make exceptions.

Not part of the exam, but handy to know: *The UK ‘Full’ licence does allow you to operate in a large number of other countries, under an international agreement called CEPT.*

10. Exam Information

Ready to take your exam? Great!

There are a couple of different ways to take your exam - either at home (remotely invigilated) or at a local amateur radio club.

10.1 About the exam

The Foundation exam lasts for 60 minutes, and the exam software will present you with 26 multiple-choice questions. The pass mark is 19 out of 26.

You are allowed a calculator, a copy of the 4-page exam booklet, a pen or pencil, a drink, and blank paper.

A photo ID is required to prove that you are genuinely the candidate.

10.2 Taking the exam at home

If you decide to take the exam at home, this will be conducted by the RSGB, and you can book an exam slot online on the RSGB exam website.

The exam uses special software, and you're monitored over a webcam to ensure there's no cheating.

Here are the technical requirements for the online exam:

- Operating system: Windows 7 (or later) or Mac OS 10.10 (or later)
- Hardware: Intel Core i3 (or equivalent) and 4GB RAM.
- Screen: Recommended minimum of 13″, resolution of 1024 x 768
- A working webcam (USB, or built-in laptop webcam)
- A working microphone and speakers
- Good, continuous internet speed, ideally 2Mbps

The exam cannot be taken using a smartphone, tablet, Chromebook or on a computer running Linux.

A few days before your exam date, you will be sent a link to the exam software, which is called “TestReach”, plus a username and

password needed to use the exam software. You will also have a video call with the exam invigilator a few days before the exam to check that everything is working – this is your opportunity to check the technology is working, and to ask any questions you may have about the actual exam. The invigilator will be an RSGB volunteer who will do their best to guide you through the exam and put you at your ease.

There is a tutorial that you can use to get familiar with how to use the TestReach software for the exam. Make sure that you spend time working through the exam software tutorial before the exam, so you're not learning how the system works on the day.

10.3 Taking the exam at a club

If you'd prefer not to take your exam online, you can potentially take your exam with the help of one of the UK's many amateur radio clubs. It's a case of locating your nearest

club(s), visiting their website and making contact to see if they have any exam sessions planned.

It's common to pay a little extra for an in-person exam, as this helps the club to cover its costs for hiring an exam venue.

You will find a list of amateur radio clubs on the RSGB website at www.rsgb.org.uk.

10.4 Exam Hints & Tips

Here are some handy tips for taking your Foundation amateur radio exam and getting the best result possible.

Preparation

Make sure you have studied all of the material – this guide contains all of the information you need to pass the exam, but use other sources too. Obviously, we're keen to recommend our own Foundation Online course, but there are others. You can also take a course or get help from your local amateur radio club, or watch various videos on YouTube.

As part of our course, and on the Essex Ham YouTube channel, look for our “Exam Hints and Tips” video as well as our Quick Revision Guide, which covers common exam topics.

Don’t wait too long between studying and taking the exam (as you’ll forget what you’ve learnt)

Take some mock tests – you shouldn’t even think about booking your exam until you can regularly get 19/26 or better on mock tests. Be warned – some online mock websites have not been updated to the current exam syllabus, so check that mocks are up-to-date.

Spend some time getting familiar with the 4-page exam booklet - what table does what, and how to look things up.

The numbers game

If there is something you don’t understand, don’t worry too much. At Foundation, you can get seven questions wrong and still pass. Here’s our guide:

Licence Conditions and Operating Procedures – 9 marks (a third of the exam), and you’ll

need to know most of this when you have your licence. Put in some effort, and take your time here! There are usually 3 questions based on the 4-page exam booklet, so use it!

Safety – 3 marks, mostly common sense.

Interference (EMC) – 3 marks, fairly straightforward stuff.

Propagation – Only 2 marks, and useful stuff to know.

Antennas – 3 marks. The antenna types are useful information. Remember that the gain table is in the 4-page exam booklet.

Transmitters and Receivers – 3 marks - The box diagrams and sidebands can be tricky.

Technical Basics – Possibly the hardest section, with the formulas and circuits to study, but it only accounts for 3 marks. The good news is you can fail this section, get another 4 questions wrong, and still pass. Don't stress this one too much.

The day of the exam

Take a couple of mock tests. Then, have a

quick review of the areas where you know you’re weak.

Review some of the more challenging areas that might come up in the exam, for example:

☐ The two formula triangles

☐ Receiver, transmitter and SDR block diagrams

☐ Callsigns and Regional Secondary Locators

☐ The five standard antenna types

☐ Have a scan through the 4-page exam booklet, and refresh your memory on the Schedule and Band Plan exclusions

If you're using your computer to take the exam, make sure that it has had all of its operating system and anti-virus updates, as you don't want your computer to be slowed down or interrupted for software updates during your exam.

Just before the exam

Make sure you have everything ready and are comfy. You’re allowed a drink during your exam (we suggest non-alcoholic!).

Make sure you have your 4-page exam booklet, a pen, some blank paper and a calculator. No other notes are allowed in the exam.

Relax! The exam isn't life or death - if you don't pass the first time, who cares? You can always take it again when you're more prepared.

During the exam

The exam time is one hour, which is plenty of time. Many people finish earlier, but don't be rushed. We recommend you spend at least one minute per question. Here is what you need to do with each question:

- Read each question carefully.
- Read through every single answer – don't just pick the first one that "sounds sort of right".
- Work out which of the question's answers are definitely wrong.
- Select the answer that is MOST right, not the first one that looks right.
- Use the exam booklet every time a

frequency is mentioned to check what the rules are for that frequency.

If you're unsure about a question, flag it, move on, and come back later — there's no penalty for changing your mind before submission.

At the end of the exam, go through all of the questions and answers again, asking yourself, "Am I sure this is the best answer?". Try not to leave any question unanswered – go with your 'best guess'.

At the end of the exam, go through all of the questions and answers again, asking yourself, "Am I sure this is the best answer?"

After the exam

If you thought one or more of the questions were unfair, tell the exam invigilator – there is a mechanism for reporting (challenging) problem questions which may be unfair (badly worded, confusing, using jargon, or just plain trick questions). We've encountered dozens of problematic questions in exams, many of which have been reported to the RSGB.

Take a note of any such question you encounter (either the wording or the question reference number), and report it to the Invigilator after the exam. We'd also encourage you to report the question to us, so we can challenge it with the RSGB, and help to make sure other students are prepared.

You can report a question at **www.sxham.uk/report**

10.5 Handy Exam Links

Got a question about the exam?

- Check out the **HamTrain Exam FAQ**

Need extra support and help?

- See our video: **Getting Extra Exam Help**

Want some mock tests?

- See: **Getting Mock Tests**

Want some more exam hints and tips?

- See our video: **Exam Hints & Tips**

11. Avoiding Exam Pitfalls

This chapter is based on feedback from hundreds of students who sat their exams in 2025 and completed the HamTrain end-of-course survey. Most people passed first time, often comfortably, but a common theme was that the exam questions were worded differently from mocks. Here are the most common RSGB exam "gotchas" reported by recent students, and how to deal with them.

Scenario-based questions

The Foundation exam rarely asks simple 'recall' questions. Instead of *"What is the purpose of a band plan?"*, you may see: *"An amateur wishes to operate voice on a crowded band. What should they do?"*

The question is testing understanding and judgement, not memory. Read the question fully before looking at the answers. Ask yourself: *What is this really testing — rules, safety, or operating procedures?* If two answers look plausible, re-read the question and pick the one that most completely fits the scenario.

“Most Correct” vs “Technically True”

A common RSGB trap is offering one answer that is technically true and another that is more correct in terms of licence conditions. The exam usually wants the safest, most compliant, licence-correct answer. Look out for wording that implies obligation, such as “must”. If in doubt, choose the answer that best matches the licence rules and safety.

Don’t assume missing details

This is one of the most frequently reported causes of lost marks. If something important is not mentioned, don’t assume it, or try to over-think. Treat it as unknown and choose the safest, most restrictive interpretation. Many candidates lose marks by adding extra information that isn’t stated.

Negative wording

RSGB questions often include words such as NOT, EXCEPT, or phrases like *“which of the following is incorrect?”* These are easy to misread under time pressure, so slow down. Check that your chosen answer matches the wording. Many candidates know the topic well but lose marks by answering the opposite of what was asked.

Frequency and allocation traps

Several candidates reported losing marks on frequency questions even though they understood the bands well and had the band plans in front of them. Common pitfalls include missing secondary allocations (especially satellites) or missing something in the band plan. Read all four answers before eliminating any, and use the exam booklet to check allocations rather than guessing.

Propagation: keep it simple

Some candidates reported being caught out by questions mentioning tropospheric effects and weather. These questions aren’t testing deep theory. RSGB usually wants the correct association (e.g. troposphere = weather effects; ionosphere = HF

propagation). If an answer looks overly detailed or advanced, tread carefully.

EMC and interference

Several candidates noted that some questions focused on other equipment interfering with radio reception, rather than the radio causing interference to other devices. Examples included domestic electrical tools. Think realistically about what produces interference, choose the answer that best matches real-world EMC behaviour, and avoid over-complicating it.

“Unfamiliar” questions

A repeated theme in feedback is: “There were a few questions I didn’t remember seeing before.” That doesn’t mean the training material was missing anything; this usually indicates that the wording was unfamiliar or the topic was approached from a different angle. Eliminate obviously wrong answers, look for the option that aligns with licence principles, and trust your preparation.

Always use the booklet

That 4-page exam booklet is there to be used. Candidates consistently report that questions involving bands, frequencies, or allocations are often free marks. It is better to check than guess.

Final advice from candidate feedback

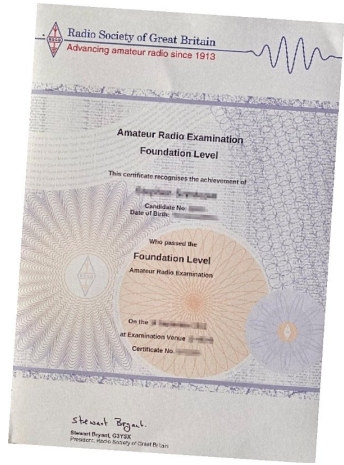
Candidates who passed consistently reported that the exam was fair but carefully worded. Most difficulty came from interpretation, not knowledge. Reading slowly mattered more than speed. Read each question carefully, avoid assumptions, and choose the most correct answer — not just the first one that sounds right.

Hopefully some useful advice there from former students. We’d also encourage you to keep taking mock tests, as they are a proven way to get you used to the types of questions you might encounter. The HamTrain pool of mock questions is constantly being revised based on student feedback, and the RSGB releases free mock papers. Best of luck with your exam.

12. After You've Passed

Passing the Foundation exam is a real achievement. You've learnt new material, taken an exam, and earned the right to operate on the air, so well done!

Once you've passed your Foundation exam, you'll receive a pass certificate from the RSGB in the post – this certificate includes your candidate number, which will be needed to obtain your licence and callsign.


Radio Society of Great Britain
Advancing amateur radio since 1913
Amateur Radio Examination
Foundation Level
This certificate recognises the achievement of
Candidate No.
Date of Birth
Who passed the
Foundation Level
Amateur Radio Examination
On the
at Examination Venue
Certificate No.
Stewart Bryant
Stewart Bryant, G3YSX
President - Radio Society of Great Britain

Sample Foundation Pass Certificate

Once you have your pass certificate, you will need to create an account on the Ofcom Licensing website.

Remember to keep a note of your password, as you'll need to log on to validate your licence every 5 years.

When you have created your Ofcom account, you can apply for your free licence using the Candidate number printed on your pass certificate. At this point, you'll be able to choose your amateur radio callsign.

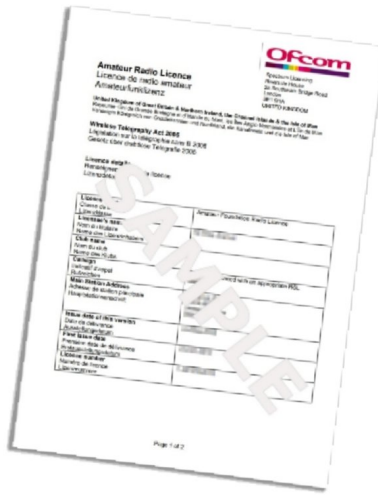
Selecting a callsign

At the time of writing, the Foundation callsign prefix is "M7", and you're able to choose your own callsign on the Ofcom website, provided it has not already been taken. We have a handy checker on our website to allow you to check in advance to see if your preferred callsign has been taken – Go to

www.sxham.uk/m7check

Getting your licence

Once you have selected a valid callsign, you'll be able to print and download a PDF copy of your licence.



Sample Foundation Licence document

The printable version of your licence is a two-page document – you may also find it useful to download and/or print Ofcom's Amateur Radio Licence Conditions Booklet OFW611. This 24-page document contains the actual licence conditions that you'll need to comply with, and is a handy source of reference when deciding what you can and can't do on-air.

What next?

Once you have your licence and callsign, you're on your way, and you're free to explore the world of amateur radio. There are so many options open to you that it's impossible to give any real guidance in this study guide, but here are a few options to consider:

More study: The next licence level is Intermediate. Some people will be happy staying at Foundation, whilst others may want to dive into studying for the next level, while Foundation is still fresh. As with Foundation, there are various courses, books and online study resources. Before you ask, HamTrain does not offer an Intermediate course, but there are several other courses out there, and you can find a list of study resources at **www.hamtrain.co.uk**

Getting on the air: Many will be keen to get on-air as soon as possible and start making contact with others. There are a few things to consider first, including what equipment to get, plus the practicalities of making contacts.

As there are so many options (handheld, base station, mobile, HF or VHF/UHF, analogue or digital, etc), you'll need to think about your options here, perhaps seeking advice in our online forum, Facebook or Discord groups. It's also a good idea to do some listening first, to get used to the etiquette.

Connecting with locals: Many people start out on VHF/UHF, often with a cheap handheld radio. These do have limitations in terms of range and build quality, but they will allow you to listen in to local activity and hopefully access a nearby repeater. You can start to make local contacts, and perhaps take part in 'nets. It's also worth checking out your local amateur radio club – they can be a mixed bag, but they can be a great way to meet local amateurs and get some advice. Local events, whether at a club, a special event station or a "rally", provide excellent opportunities to meet like-minded locals and form new friendships in the amateur radio community.

Online resources: Consider becoming a free

member of Essex Ham (you don't have to be from Essex) – we have various videos, several "Getting Started Guides", a forum, a Facebook group, a Discord server and a newsletter. Find out more at **www.essexham.co.uk** as well as **www.hamhub.uk**

13. Glossary

Some of the terms that you may experience when studying for your Foundation exam:

Term	Description
AM	Amplitude Modulation. This is a method of combining audio (e.g. speech) with a carrier to create a radio signal. The audio changes the amplitude (height) of the carrier's waveform.
ATU	Antenna Matching Unit. Used to "match" antenna impedance to the transmitter, to reduce VSWR.
Attenuate	To reduce the energy of a radio signal. As an example, heavy rain attenuates (reduces the strength of) radio signals at UHF.
Balun	A device that couples balanced and unbalanced feeder / antennas. For example, you would use a balun to connect a balanced antenna (such as a dipole) to an unbalanced

coaxial cable.

CQ	A general call asking for someone to make contact with you.
CW	Continuous Wave – Also known as Morse Code.
CTCSS	Continuous Tone Coded Squelch System. Sub-audible tone by your radio sent alongside a transmission, to allow a repeater to “open”.
dB (Decibels)	dBi (associated with the measurement of gain (or loss). At Foundation, recall that Yagi (beam) antennas have a gain measured in dB.
EMC	Electro-Magnetic Compatibility. The avoidance of interference between equipment.
EMF	Electro-Magnetic Fields. When transmitting, amateurs are required to ensure that the EMF they generate is below recommended limits.
EIRP	Effective Isotropic Radiated Power – Power being radiated by your antenna (compared to a theoretical "isotropic' antenna).
ERP	Effective Radiated Power – The power your antenna is outputting (calculated by multiplying the power in watts by the antenna's “gain” when compared to a half-wave dipole antenna).
FM	Frequency Modulation. The signal changes the frequency of the carrier’s waveform.
Impedance	An antenna has an impedance, which is

measured in Ohms at the feed point. The impedance depends on the size and shape of the antenna, how it's positioned, and the frequency transmitted.

Ionosphere	A layer of ionised gases 70-400km above Earth, that refracts HF radio signals back to Earth.
Q Codes	Shortened codes that are used on amateur radio. Common codes are: QTH (Location); QSL (Acknowledgement of receipt); QRZ (Who is calling); QRM (Man-made interference); QRP (Reduced power); QSY (Change frequency); and QSO (communication).
RF	Radio Frequency.
SSB	Single Sideband. Either USB (Upper Sideband) or LSB (Lower Sideband). These are methods of transmission, like FM and AM.
VFO	Commonly found on a radio, this button allows you to enter "tuning" mode so you can select frequencies (as opposed to stored radio memory presets)
VSWR	Voltage Standing Wave Ratio. Shows how much power is being reflected back from the antenna? (1:1 is perfect; over 3:1 might be causing damage to the transmitter).

14. Foundation Mock Exam

Our free Foundation Online course includes various quizzes and mock tests, and we have loads of mocks available via our online classroom and website. We strongly advise you to take some mock tests before you book and sit your actual Foundation exam.

To help see how you're progressing, here are 26 questions from our mock question bank.

Find yourself a piece of paper and a pen, and jot down the answers to all 26 mock questions to see how you get on. The

answers can be found in Appendix B.

Question 1

Which of the following is NOT permitted by the amateur radio licence?

a) Talking about the weather

b) Discussing the makes and models of radios

c) Advertising prices of your home-made antennas

d) Use of codes

Question 2

You're chatting to a friend and decide to change frequency as you can hear another station. Once on the new frequency, what should you do?

a) Note the time, date and frequency in your log

b) Make sure you give your callsign

c) Wait for 30 minutes to make sure

the frequency is not in use

d) Return to the calling frequency

Question 3

The operator of a station who contacts you does not give their callsign, even when asked more than once. What action should be taken?

a)Report the incident to the police

b)Keep repeating the question

c)Terminate the contact

d)Note the contact in your log

Question 4

Any individual authorised by Ofcom has the right to do what?

a)Close down your amateur radio station

b)Require that you modify your amateur radio equipment

c)Restrict the operation of your amateur radio equipment

d)All of the above

Question 5

At Foundation, can you transmit to a satellite on 437.990MHz?

a)No

b)Yes, as a primary user

c)Yes, as a secondary user

d)Yes, provided you are 100km away from Charing Cross

Question 6

Ofcom requires radio amateurs to keep records of what?

a)EMF assessments

b)Contacts outside of the UK

c)Changes to your station equipment

d)Operations away from your Main Station Address

Question 7

Which of the following is an electrical insulator?

a)Gold

b)Copper

c)Brass

d)Ceramic

Question 8

Which of the following frequencies would you find on the HF bands?

a)909kHz

b)14.070MHz

c)145.5MHz

d)432.6MHz

Question 9

What is NOT true of analogue signals?

a)They can constantly change in amplitude

b)They can constantly change in frequency

c)They are a stream of finite values

d)Amplitude and Frequency can vary

constantly

Question 10

Which of the following describes the process of "Modulation"?

a) Ensuring that the transmitter is on the same frequency as the distant receiver

b) Extracting the transmitted data or voice from the radio frequency carrier

c) Ensuring that the transmitter is on the same frequency as the local receiver

d) Adding the data or voice to be transmitted to the radio frequency carrier

Question 11

A transmitter's RF power amplifier should be...

a)Connected to a correctly matched antenna

b)Connected to the output of the demodulator

c)Tuned to the precise transmit frequency

d)Adjusted using the squelch control

Question 12

In a receiver, what does a detector do?

a) Tunes in to the required signal

b) Amplifies a weak signal

c) Removes the carrier

d) Detects the frequency to generate

Question 13

What type of feeder is "balanced" (having equal and opposite signals in two wires)?

a)Coaxial cable

b)Twin Feeder

c)SMA

d)Screened

Question 14

Which of the following is TRUE:

a)ERP is calculated by multiplying watts by gain

b)A Dipole antenna has a typical SWR of 1:4

c)All Yagi antennas are omnidirectional

d)As frequency increases, so does the antenna size

Question 15

Which type of cable is fitted to a PL259 plug?

a)Two core AC mains

b)Three core AC mains

c)Ladder-line

d)Coaxial cable

Question 16

The layers of conductive gases that are between 70 and 400km above the Earth are known as the

a)troposphere

b)ionosphere

c)mesosphere

d)Van Allen belt

Question 17

Which of the following is more likely to attenuate (reduce) the range of UHF signals?

a)Snow and Ice

b)The time of day

c)Skywave propagation

d)Tropospheric ducting

Question 18

A piece of equipment's ability to work properly in the presence of strong RF signals is known as what?

a)Immunity

b)Resilience

c)Conductivity

d)Durability

Question 19

If fitting a filter to reduce interference from a radio signal, where should it be fitted?

a)As close to the transmitter aerial as possible

b)As close to the transmitter as possible

c)As close to the receiver aerial as possible

d)As close to the affected equipment as possible

Question 20

It is proving difficult to determine how an amateur transmission is interfering with a neighbour's television. The amateur should try getting advice from whom?

a)The Radio Society of Great Britain

b)The British Standards Institution

c)The planning department of the local council

d)The Radio Licensing Centre

Question 21

Why is UTC used for logging purposes?

a)It allows the shack clock to be left on the same setting all year round

b)It is specified in the amateur radio licence by Ofcom

c)It is used worldwide to avoid confusion of different time zones

d)It saves having to remember whether it is GMT or BST

Question 22

APRS is a data mode used to allow amateur radio operators to find each other on maps. It works by transmitting callsign and location data over amateur radio. Which of the following frequencies is used for APRS?

a)144.300MHz

b)144.600MHz

c)144.800MHz

d)144.950MHz

Question 23

It's recommended that you ask an amateur radio friend to comment on your transmitted audio signal when you start using a new microphone. Why is this?

a)The transmit frequency might need adjusting

b)The microphone may be tuned to the wrong band

c)To prove that it wasn't a waste of money

d)The microphone gain on the transmitter may need to be re-adjusted

Question 24

The inside of a mains fuse contains what?

a)a coil of thin wire wound around a core

b)a piece of metal designed to melt at a certain current

c)An insulated ferrite ring

d)two metal plates separated by an insulator

Question 25

Eye protection should be worn when drilling in order to

a)hold your glasses (if worn) in place

b)allow closer inspection of the work

c)prevent swarf from entering your eyes

d)protect your employer's safety record

Question 26

Transmitters connected to particularly high antennas may need special safety protection against what?

a)Lightning strikes

b)Strong RF fields

c)Low SWR

d)ICNIRP

You'll find the answers in Appendix B.

The pass mark is 19 out of 26

There are several more mock tests on the HamTrain website: www.hamtrain.co.uk

We also publish a companion book to this one, called **"Foundation Mock Tests".** Available in paperback and eBook formats, the book includes 6 complete mock tests (over 150 questions), plus an explanation of each answer. **See www.sxham.uk/mockbook**

15. FAQ: Your Questions Answered

Q. How do I book an exam?

If you want to take your exam online, book a time and date on the RSGB website. Shortlink: www.sxham.uk/bookexam

If you'd rather take your exam at a local exam centre, contact your local amateur radio club. Shortlink: www.sxham.uk/rsgbclubs6

Q. What do I bring to my exam?

You are allowed to use the 4-page exam booklet in the exam. For exams taken at home, you can print the booklet, but it must be free from additional notes.

You can take a pen, a pencil and a soft rubber.

You can use a silent, non-programmable calculator.

You can take a drink and sweets (remove excess packaging).

You're allowed a mascot.

Blank paper may be permitted by some examiners (it's not stated in the rules, so check first).

A non-electronic translation dictionary is allowed where appropriate.

You are not allowed any written notes, course books, phones or smartwatches, or any additional computers.

Q. What webcam do I need?

For exams that you take at home, you will need a webcam so that the invigilator can monitor you during the exam. Before the exam, the invigilator will ask you to move the webcam around so that the room can be checked out.

If your laptop has a built-in webcam, that will be fine; otherwise, you can buy cheap USB webcams online or on the high street.

Q. Can I take the exam on Linux / Chromebook / iPad / Android?

Sorry, no. The exam software only runs on Windows or Mac OS.

If you don't have access to a suitable computer, then you can potentially take the exam at a nearby amateur radio club or borrow a suitable computer for the exam.

Q. Where can I get mock tests?

Mocks are an excellent way to study and can prepare you for some of the

unexpected question types that you may get in the actual exam. This guide includes one of our mock tests, and if you're using our online course, you'll also be getting a quiz at the end of each section, plus various mock tests. Extra online mock tests based on our pool of 300 tried and tested mock questions are also available from us via our website.

There are also free printable mock tests on the RSGB website, and we have released a book of mock questions (search for HamTrain's Foundation Mock Tests). There are also various mock apps and websites, but we're aware that several of these are not up-to-date and don't reflect recent syllabus changes. Always check that any mocks are based on the current syllabus.

For a list of mocks, go to shortlink: www.sxham.uk/mocks

Q. I need help with the 4-page exam booklet

You will need to have a paper copy of this with you during the exam. If you are taking the exam at home, print off a copy from shortlink: www.sxham.uk/ex307

On that web page, we also have a video that goes through each page of the exam booklet, showing how to use this in your exam.

Can't print the booklet? Ask someone to do this for you, or try a local library or print shop.

Q. The material is not sinking in. Help!

If some of the information just isn't making sense, it could be down to the way you're studying. Reading from a book doesn't suit everyone, which is why we also have videos covering every section of the Foundation syllabus. For those on our free online course, we also have extra videos on the more complex topics, such as sidebands and formula triangles, as well as video examples of making a simple contact and using a repeater. Shortlink:

www.sxham.uk/trainvids

For some, online and book-based training just doesn't work – see if your local club offers training or support, or has a friendly member able to offer some extra coaching and advice on tricky topics.

Q. I need extra help or support

Additional support is available for students who may need extra help with the exam or who have dyslexia or sight issues. We have a page and video for those who need help. Go to shortlink www.sxham.uk/examhelp

You should also contact the RSGB Exam Team to see if any adjustments can be made to your exam. You can call them on 01234 832700 – or see shortlink www.sxham.uk/rsgbcon

Q. What happens if I fail?

Everyone wants to pass the first time, but not everyone does, and that's nothing to

worry about. If you've prepared properly and crucially, done well in mock exams, then you should have no problem. If you do fail, then take it as a learning experience, study the areas where you went wrong, and simply book another exam session (you'll have to pay the exam fee again).

Amateur radio is a hobby, and there's no shame in failing on the first attempt. You'll just be better prepared for the second attempt.

Q. I had a poor or unfair exam question

You wouldn't be the first! Some of the exam questions can be a little odd, either written in an unclear manner or using terminology that you weren't expecting. There are a couple of things you can do:

Challenge the question formally with the RSGB. If the question is unfair, your exam may be re-marked. Contact the RGSB exam team on 01234 832700 – or see shortlink www.sxham.uk/rsgbcon

Let HamTrain know. We keep a log of problem questions, can challenge these on your behalf, and can warn other students. Log any problems at shortlink: www.sxham.uk/report

Q. I have a question you haven't answered

Take a look at our full FAQ here: Shortlink: www.sxham.uk/faq

If your question relates to the exam, it may be best to contact the RSGB Exam Team directly. You can call them on 01234 832700 – or see shortlink www.sxham.uk/rsgbcon

HamTrain's Online FAQ

16. Mock Exam Answers

1. Licensing	**2.** Licensing	*Commercial activity is not permitted. Codes, such as Morse, are permitted.*
3. Licensing	**4.** Licensing	*You need to give your callsign when establishing contact on a new frequency.*
5. Licensing	**6.** Licensing	*You can only talk to other radio amateurs. This person may not be licensed.*
7. Licensing	**8.** Licensing	*Your licence is the authority to do all of those things*
9. Licensing	**10.** Licensing	*The answer can be found on page 2 of the 4-page exam booklet*
11. Licensing	**12.** Licensing	*Amateurs are required to perform an EMF assessment on their station*

Term Basics	*Term Basics an insulator; it doesn't conduct electricity*
The HF Band	*The HF band is defined as 3MHz to 30MHz*
Digital Signals	*Digital signals are defined as a stream of finite values*
The Modulation	*The modulation process in a transmitter mixes the audio signal with the radio frequency.*
Transmitters	*Refer to the Transmitter block diagram. The RF Amplifier connects to the antenna.*
The Detector	*The detector (or demodulator) extracts the original audio signal from the carrier.*
Feeders	*Ladder feeder (or ladder line) is balanced. Coaxial cable is unbalanced.*
Effective Radiated Power	*Effective Radiated Power (ERP) is the power fed to an antenna multiplied by the antenna gain.*
PL-259	*The PL259 plug is designed for coaxial feeder.*
The Ionosphere	*The Ionosphere is a layer of conductive gases between 70-400km that allows HF propagation.*

87	Propagation *Mountains and heavy rain can reduce the range of UHF radio signals*
88	Immunity *Immunity is a device's ability to work in the presence of strong radio frequency fields.*
89	EMC filter *An EMC filter is fitted close to the affected equipment to reduce interference from other sources.*
90	RSGB *The RSGB provides free leaflets and advice on handling interference*
91	UTC *Operating is organised around the world so that logs of transmissions match up, regardless of local time*
92	Operating *You'll find the answer in the 2m band plan on page 3 of the 4-page exam booklet.*
93	Setting *Setting the microphone gain correctly reduces the risk of poor audio and interference to adjacent frequencies.*
94	Fuses *Fuses contain a piece of metal that melts when the current is high, breaking the circuit.*
95	Safety *Safety is sharp bits of metal created whilst drilling, so eye protection is needed.*

There is a risk of lightning with high antennas			

The pass mark for the Foundation exam is 19 out of 26

You'll find more mock tests on the HamTrain website at www.hamtrain.co.uk, or see our sister book, "Foundation Mock Tests", which contains 6 complete mock tests, with answers.

Appendix A: Exam Reference Material

For your Foundation exam, you'll only be allowed to take one document into the actual exam – that's the 4-page exam booklet, RSGB Reference EX307.

You can download and print this from the following link: **www.sxham.uk/ex307**

We recommend you download and print this 4-page booklet for your revision and get familiar with every aspect of this booklet.

Radio Society of Great Britain
Advancing amateur radio since 1913

Reference Data
for use in the
Foundation Level Examination

What next:

Once your results arrive at RSGB HQ they will usually be processed after 6 working days have elapsed, then your official result will be posted to you and uploaded to the Ofcom system. Results are not available any sooner.

To obtain your licence please log on to the Ofcom website www.ofcom.org.uk and follow the online instructions.

Queries:

Invigilators are not permitted to explain or comment on questions but you may draw their attention to any question you believe is wrong. Please do that before you submit your answers to allow the question number to be noted.

You may also comment on any aspect of the examination, either to the invigilators or
to the RSGB Examinations Office exams@rsgb.org.uk. All comments should be received within 5 days of the examination.

All comments are dealt with in strict confidence.

The booklet contains answers to questions that may come up in your exam, as well as in the mocks featured in this booklet, so make sure you know your way around this document. We have produced a detailed video exploring this booklet, and you will find this at: **www.sxham.uk/trainvids**

On the next few pages, you'll find examples of the information in the booklet. The size of the print used in our book may make this hard to read, which is why we recommend you have an A4 printed copy to hand.

A1. Foundation Licence Parameters

Maximum Mean Power Spectral Density (dBW/Hz)	Maximum Mean Power (dBW)	Maximum Mean Power (Watts) and dB relative to 1 Watt)
[illegible] available on the basis of non-interference-other services.		
[illegible] on the basis of non-interference-other services outside the UK or Crown Dependencies.		
[illegible] 500 mW EIRP airborne		
[illegible] available on the basis of non-interference-other services.		
[illegible] with other Services. 500 mW EIRP airborne		
[illegible] 500 mW EIRP airborne		
[illegible] 500 mW EIRP airborne		
[illegible] 500 mW EIRP airborne		
[illegible] 500 mW EIRP airborne		
[illegible] 500 mW EIRP airborne		
[illegible] 500 mW EIRP airborne		
[illegible] 500 mW EIRP airborne		
[illegible] available on the basis of non-interference-other services outside the UK or Crown Dependencies.		
[illegible] available on the basis of non-interference-other services.		
[illegible] available on the basis of non-interference-other services.		
[illegible] 500 mW EIRP airborne		
[illegible] ERP		
[illegible] available for use within 100km radius of Charing Cross, London (51°30'30"N, 00°07'24"W).		
[illegible]		
[illegible]		

[illegible]			
[illegible]			
[illegible]			
[illegible]			
[illegible]			
[illegible]			
[illegible]			
[illegible]			
[illegible]			
[illegible]			

A2. 144MHz (2m) Band Plan

Frequency Range	Allowed Radio Usage	Necessary Bandwidth
144.000-144.025	All modes including Satellite downlinks	2700Hz
144.025-144.100	Telegraphy (including EME CW)	500Hz
144.050 Telegraphy Centre of Activity		
144.100 Random MS telegraphy calling (Note 1)		
144.100-144.150	Telegraphy and MGM	500Hz
EME MGM activity		
144.150-144.400	Telegraphy, MGM and SSB	2700Hz
144.250 GB2RS news broadcast and slow Morse		
144.260 See Note 10		
144.300 SSB Centre of Activity		
144.370 MGM MS calling		
144.400-144.500	Propagation Beacons only	
144.400-144.500	Beacons and	
144.491-144.493 Personal Weak Signal MGM Beacons (BW: 500 Hz max)		
144.500-144.794	All modes	12 kHz
144.500 Image Modes (SSTV, Fax etc)		
144.600 Data Centre of Activity (MGM, RTTY etc)		
144.6125 UK Digital Voice (DV) calling (Note 9)		
144.625-144.675 See Note 10		
144.750 ATV Talk-back		
144.775-144.794 See Note 10		
144.794-144.990	MGM Digital Communications	12 kHz
144.800-144.9875 Digital modes (including unattended)		
144.8000 Unconnected nets - APRS, UiView etc (Note 14)		
144.8125 DV Internet voice gateway (IARU common channel)		
144.8250 DV Internet voice gateway (IARU common channel)		
144.8375 DV Internet voice gateway (IARU common channel)		
144.8500 DV Internet voice gateway (IARU common channel)		
144.8625 DV Internet voice gateway (IARU common channel)		
144.8750 - 144.9125 - Internet Gateways		
144.9250 Digital usage		

144.9375 Digital usage		
144.9500 Digital usage		
144.9625 FM Internet voice gateway		
144.9750, 144.9875 Low power / Adhoc repeater inputs (Note 11)		
144.9875 - 145.1375	3 Repeater input exclusive (Note 2) (Note 12)	12 kHz
145.200	pace communications (e.g. I.S.S.) - Earth-to-Space	12 kHz
145.2000 (Note 4) & (Note 10)		
145.200 - 145.3375	M/DV simplex (Note 3) (Note 5) (Note-6)	12 kHz
145.2250 Internet gateways - and See Note 10		
145.2375 FM Internet voice gateway (IARU common channel)		
145.2500 Used for slow Morse transmissions		
145.2875 FM Internet voice gateway (IARU common channel)		
145.3375 FM Internet voice gateway (IARU common channel)		
145.5000 FM calling (Note 12)		
145.5250 Used for GB2RS news broadcast.		
145.5500 Used for rally/exhibition talk-in		
145.5750, 145.5875 Low power / Adhoc repeater outputs (Note 11)		
145.5875 - 145.7375	3 Repeater output (Note 2)	12 kHz
145.800	pace communications (e.g. I.S.S.) - Space-Earth	12 kHz
145.800 - 146.000	ellite exclusive	12 kHz

The above table is © RSGB, reproduced here for instructional purposes.

A3. 14MHz (20m) Band Plan

Frequency Range	Amateur Radio Usage	Necessary Bandwidth
14,000 - 14,060 kHz	**Telegraphy, contest preferred**	200 Hz
14,055 kHz QRS (slow telegraphy Centre of Activity		
14,060 - 14,070	**Telegraphy**	200 Hz
14,060 kHz QRP (low power) Centre of Activity		
14,070 - 14,089	**narrow band modes**	500 Hz
14,089 - 14,099	**narrow band modes -** automatically controlled data stations (unatten	
14,099 - 14,101	**IBP beacons exclusively**	
14,101 - 14,112	**narrow band modes -** automatically controlled data stations (unattended)	2.7 kHz
14,112 - 14,125	**all modes (excluding digimodes)**	2.7 kHz
14,125 - 14,350	**all modes** SSB contest preferred segment	2.7 kHz
14,130kHz - digital voice centre of activity		
14,195 + - 5 kHz Priority for Dxpeditions		
14,230 kHz - Image Centre of Activity.		

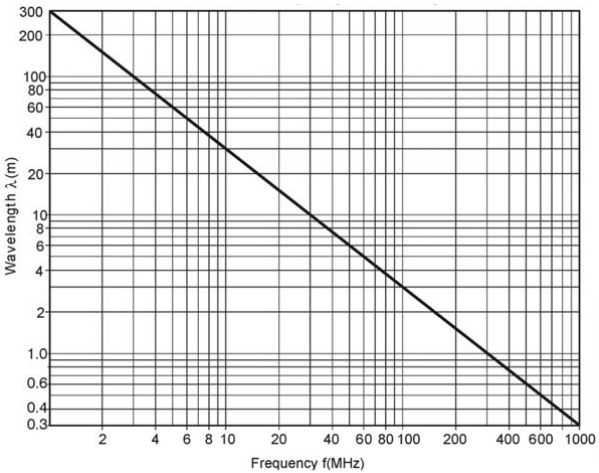
14,285 kHz - QRP Centre of Activity

All modes	14,300 - 14,350	2.7 kHz

14,300 kHz Global Emergency Centre of Activity

The above table is © RSGB, reproduced here for instructional purposes

A4. Frequency / Wavelength Conversion Table



The above graphic is © RSGB, reproduced here for instructional purposes

A5. Frequency Allocation Table

Frequency (MHz)	Use
87.5 - 108.0	Broadcasting
108.0 - 117.975	Aeronautical Radionavigation
117.975 - 137.0	Aeronautical Mobile
137.0 - 138.0	Space Operations & Space Research
138.0 - 144.0	Land Mobile
144.0 - 146.0	Amateur & Amateur Satellite
146.0 - 149.9	Mobile (except aeronautical mobile)

Radionavigation-Satellite		
Radio Astronomy		
Land Mobile		
Maritime Mobile		
Land Mobile		
Maritime Mobile		

A6. dB Conversion Table

dB	Multiplier
3dB	x 2
6dB	x 4
9dB	x 8
10dB	x 10

Appendix B: Syllabus Question Breakdown

Exam questions are set in accordance with the RSGB syllabus. The following table shows how we understand the 26 Foundation exam questions to be apportioned. This may not be 100% accurate and is provided here as a guide only.

Syllabus Ref.	Exam Question
1A1	1
1A2	
1A3	
1A4	2
1B1	3
1C1	
1C2	
1D1	4
1D2	

EC1	Electromagnetic fields	5
FH1	Foundation schedule	6
2A1	Fundamental theory	7
2A2		
2B1	Power	
2C1	Resistance	
2C2		
2C4		
2E1	AC theory	8
2E2		
2E7		
2H1	Cells and power supplies	
2F1	Digital signals	9
2F2		
3A1	Transmitter concepts	10
3A2		
3A3		
3A4		
3B1	Transmitter block diagram	11
3C1	Oscillators	
3E1	RF amp & modulators	
3F1	RF power amplifiers	
3F3		
3G1	Transmitter interference	
3H1	Receiver concepts	12

3H2		
3K1	modulation	
3M1		

4A1	feeder	13
4A2		
4B1	baluns	
4C1	antenna concepts	14
4C2		
4C3		
4C4		
4C5		
4C6		
4D1	antenna types	
4E1	standing waves	15
4E2		
4F1	AMU	
4G1	plugs and sockets	

5A1	propagation concepts	16
5A2		
5B1	ionosphere	
5B2		
5C1	VHF / UHF	17
5C2		
5C3		

6A1	EMC concepts	18
6A2		
6A3		
6A4		
6B1	Interference sources / Routes of entry	19
6C1		
6D1	Filtering	
6D4		
6E1	Station design (General)	
6E2		
6F1	Station design (Mobile)	
6F2		
6F3		
6G1	Social aspects	20
6G2		

7A1	Good operating practices and procedures	21
7A2		
7A3		
7A4		
7A5		
7A6		
7A7		
7A8		
7B1	Band Plans	22
7B2		
7C1	Repeaters	

7C2		
7D1 Input devices to transmitters	23	
7E2 Codes and abbreviations		
7F1 Digital Interfaces		
7G1 Satellites		
7H1 CEPT (overseas)		
8A1 Electricity safety	24	
8A2		
8A3		
8A4		
8A5		
8A6		
8A7		
8A8		
8B1 Tools	25	
8B2		
8B7		
8C1 Working at height		
8C2		
8C3		
8D1 Working with RF	26	
8D2		
8D3		
8D4		
8E1 Lightning		
8F1 Working mobile and portable		

8F2
8F3
8F4
8F5

Note: The syllabus references quoted here will appear on your exam results feedback, so this table can be used to look up which questions you got right or wrong in your final exam.

Appendix C: 2024 Licence Changes

In February 2024, Ofcom made some changes to the amateur radio licence. The study material in this book has been updated to reflect the changes, some of which are examinable, but for information, here is a summary of what Ofcom changed in 2024:

- ☐ Regional Secondary Locators (e.g. MW7, MM7, MI7, etc) are now optional – Except for Intermediate 2x callsigns, where the letter is still mandatory

☐ Those in England can add an optional “E” to their callsign at Foundation and Full (e.g. ME7QQQ)

☐ Power increases:

Foundation: 25 watts (most bands)
Intermediate: 100 watts (most bands)
Full: 1,000 watts (primary bands)

☐ From late 2025, Ofcom ceased to issue 2x Intermediate callsigns – they have now been replaced with the M8 and M9 series.

☐ Any suffix is now allowed after a callsign (e.g. “M7QQQ/Garden”)

☐ Airborne use is now permitted to a maximum of 0.5 watts EIRP (only on primary bands)

☐ Supervision of unlicensed people is allowed at all three licence levels

☐ There is more flexibility for Beacons,

Gateways and Repeaters, and licensing updates to remote and unattended operation

- ☐ Foundation licence holders can now build their own transmitters
- ☐ Foundation now has access to 2.4GHz and 5GHz (max 2 watts)

You will find a video outlining the changes on the Essex Ham YouTube Channel.

Appendix D: Resource Hub

A quick reference to all the online resources mentioned in this guide.

HamTrain Course & Resources

- **HamTrain Foundation Online course** – www.hamtrain.co.uk
- **Course videos** – www.sxham.uk/trainvids

Exam Links

- **Foundation 4-page exam booklet (EX307)** – www.sxham.uk/ex307
- **Book your exam** - www.sxham.uk/bookexam
- **Find your local RSGB club** - www.sxham.uk/rsgbclubs

- **Contact RSGB -** www.sxham.uk/rsgbcon
- **Need extra help?** www.sxham.uk/examhelp

Licensing & Callsigns

- **Ofcom Amateur Radio –** www.sxham.uk/ofcomar
- **Check if your callsign is available (M7) –** www.sxham.uk/m7check

EMF & Safety

- **EMF Calculator & Guidance –** www.sxham.uk/emf

Exam Prep

- **Exam Hints & Tips (video) –** www.sxham.uk/trainvids
- **Quick revision material –** www.sxham.uk/revise
- **HamTrain Exam FAQ –** www.sxham.uk/faq
- **Report a problem exam question –** www.sxham.uk/report

- **Mock Tests** – www.sxham.uk/mocks and www.sxham.uk/mockbook

Organisations

- **Essex Ham** – www.essexham.co.uk
- **HamHub UK** – www.hamhub.uk
- **Ofcom** – www.sxham.uk/ofcomar
- **Join RSGB** – www.sxham.uk/joinrsgb

About The Author

Pete Sipple (callsign M0PSX) obtained his amateur radio licence in 2010, following a lifelong interest in radio. After being a member of various traditional amateur radio clubs, Pete decided to form an online community, Essex Ham, which now has over 5,000 members worldwide. This group aimed to help promote amateur radio, raise awareness for the hobby and provide a useful online resource.

Pete formerly worked in the broadcast

radio industry as a producer and engineer. He later developed an interest in mobile comms, becoming a software project manager, as well as a part-time college lecturer.

Following his interest in furthering amateur radio, Pete launched training courses at clubs in Essex, developing award-winning training material. Creating an online training course seemed an obvious next step, hence the creation of the Foundation Online course that has now helped thousands of new amateurs to get started in the hobby.

Pete Sipple M0PSX

Our thanks:

Thanks to the following people who have

supported us over the years, especially those who have helped us with training initiatives in recent years, with special thanks to:

- Andrew M0ONH
- Andrew M0OTV
- Dorothy M0LMR
- Kelly M6KFA
- Paul G7BHE (www.prepcomms.uk)
- Richard G7OED
- Sarah M6PSK
- Trevor G3AKA

Our thanks also to the team of volunteer exam invigilators across the UK, without whom we'd have no online exams.

And Finally…

We hope you have found this guide useful and that it helps with your studies.

If you have any feedback about this guide, please do let us know, so that we can continue to make improvements and updates. You can send your feedback to bookfeedback@essexham.co.uk

You can find information about updates to the Foundation Study Guide at: www.sxham.uk/fsg

If you found this study guide useful, please take a few minutes of your time to rate the Foundation Study Guide on Amazon, Apple Books, Google Books

or Kobo bookstore, as this helps us to get noticed.

Please Rate Us

If you're looking to find out more about the hobby, please do check out the Essex Ham website, where you can also sign up for free as a member of one of the UK's largest online communities – you don't have to be from Essex to join.

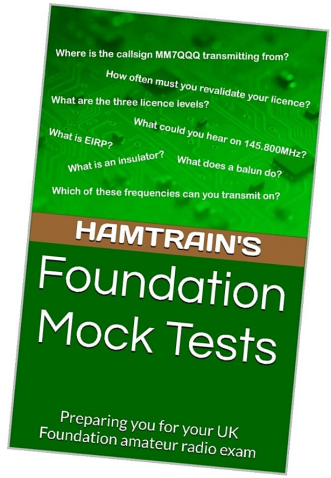
You can also sign up for our newsletter for updates on amateur radio. We're also part of HamHub UK, a growing nationwide community of radio amateurs.

Links:

- **Essex Ham Homepage**
- **HamTrain / Foundation Online**
- **HamHub UK**
- **Essex Ham Discord Server**

Thanks for reading, and best of luck with your studies.

Also from HamTrain:


Where is the callsign MM7QQQ transmitting from?
How often must you revalidate your licence?
What are the three licence levels?
What could you hear on 145.800MHz?
What is EIRP?
What is an insulator?
What does a balun do?
Which of these frequencies can you transmit on?
HAMTRAIN'S
Foundation Mock Tests
Preparing you for your UK Foundation amateur radio exam

A book of six complete mock tests to check whether or not you are ready for the Foundation exam. **Foundation Mock Tests** is available in eBook format for various platforms, as well as in paperback.

www.sxham.uk/mockbook